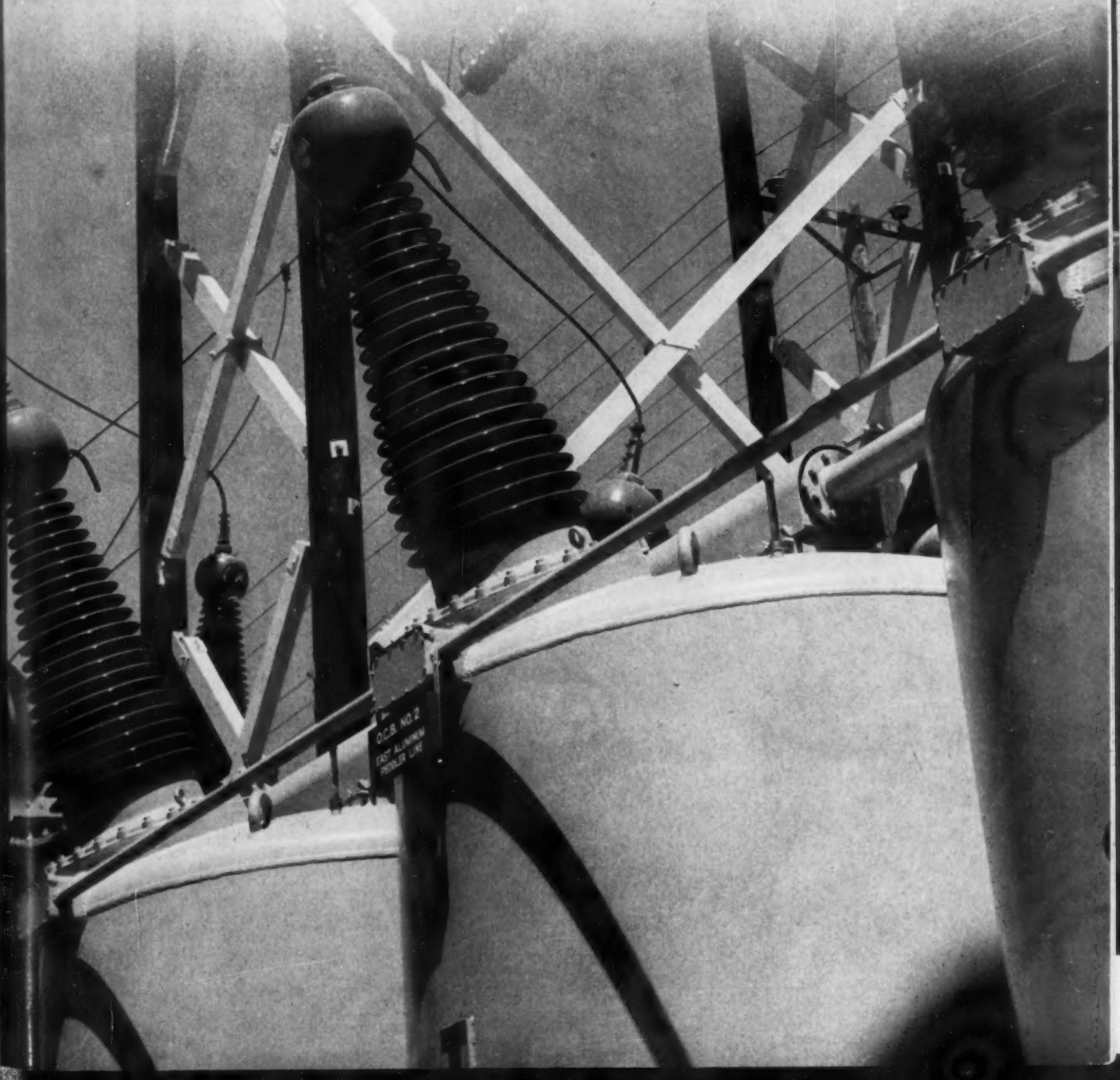
ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS

25th Annual Review and Forecast + February 1944 + 25c



INTRODUCING...
Reddy Kilowatt
To all Edison Customers
"WE'RE REALLY OLD FRIENDS!"
MEET Reddy Kilowatt
Your Tireless Electric Servant
The Fighting Kilowatt
MEET Reddy Kilowatt
On the Job 24 Hours a Day in Southern California's Oil Fields
Edison
MEET Reddy Kilowatt YOUR ELECTRICAL SERVANT
"I NEVER ASK FOR A DAY OFF"
Reddy Kilowatt
"Hired Hand" on nearly every Southern California Farm

"I've joined the Edison Company"

"Hello! I'm Reddy Kilowatt, and I work for the Edison Company. Guess you'd call me a Goodwill Ambassador. My main job is to symbolize Edison service and to help the company's customers all I can.

"For instance, I appear in Edison advertisements and point out to people how valuable their electrical equipment is, and how to take care of it so it will last longer. This month, I'm reminding the youngsters about the danger of flying kites near power lines.

"Here are some of the advertisements the Edison Company published in newspapers all over its territory to introduce me to customers."

Reddy Kilowatt says: "CONSERVATION OF ELECTRICITY WILL HELP WIN THE WAR!"

SOUTHERN CALIFORNIA EDISON COMPANY LTD.

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), February, 1944. Vol. 92, No. 2. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, 4, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold. Single copy 25c. Copyright, 1944. McGraw-Hill Company of California.

"CONCENTRIC SCALE"

A 4¼-INCH SWITCHBOARD INSTRUMENT with a 6.8-inch scale

Made in a-c ammeters, voltmeters, single-phase and polyphase wattmeters, power-factor meters, synchroscopes, and frequency meters; d-c ammeters, voltmeters, and tachometer voltmeters; and temperature meters. Accuracy: 1 per cent.

THESE new General Electric instruments give you 36 per cent better readability in only 40 per cent of the space, compared with the conventional 6-inch, rectangular semiflush type. The long scale and legible markings, and the size and shape of the pointer, combine to make possible accurate readings quickly. Approximate readings are easy at a distance of 70 feet.

In addition to these visible features we have incorporated new materials (such as alnico magnets) and perfected new manufacturing methods. The performance characteristics meet all requirements of the applicable ASA specifications. All this adds up to long-sustained accuracy throughout a wide range of operating conditions. That's why these instruments are certain to become the most widely used switchboard instruments General Electric has ever built.

FOR YOUR SWITCHBOARDS LATER Since the introduction of these instruments nearly five years ago, our entire production, totaling many thousands, has been for government requisitions, and may continue to be for some time. But you can have further information about these instruments now. Write for Bulletin GEA-3432, which illustrates the different types made in this new design and explains the various principles of operation. Address the nearest G-E office or General Electric Company, Schenectady, N. Y.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

Invest in Your Future

BUY WAR BONDS

GENERAL ELECTRIC

602-62-6200

Here in the WEST

People

Figures

are different to different people, else half the world would never get itself married. But there are figures of form and the kind that engineers, accountants, income tax sufferers and people in any kind of business need to know and use. This issue of ELECTRICAL WEST, being the annual statistical one, abounds in figures, but they are not of the Follies type. Indeed one of such figures would be somewhat aghast at finding itself in this magazine of the electrical industry. Yet even those who frankly prefer the pulchitrudinous figure best will find, with a little thought, figures of importance to them in this review of the past year's progress, despite the stresses of war. That goes for everyone.

Dealers will find clues to future merchandising policies, plans, and market information that should be valuable in shaping their own ideas for the future. They will be involved in the question of future margins, of changes in distribution, similar trends.

Contractors may get an idea of the business they can expect from new housing, installation of new appliances and equipment, necessary conversion.

Inspectors reading between the lines will discern how all of this will affect their policing of electrical safety.

Wholesalers even now are gearing their thoughts to markets, saturations, possible trends in distribution in the future which will affect them.

Manufacturers are always alert to the value of these statistics for they aid them in making their plans, scheduling distribution, forseeing potential business.

Utility Sales people are turning their attention to the tremendous reconversion job facing them and are anxious to know what their fellow companies are doing.

Utility Engineers do not need to be told the value of information of every kind. Even more of such facts and figures could be used by them if they were available. There are significant figures for everyone in these pages.

Pages

All Out for War 53
Highlights of operations of electric utilities in the eleven Western states.

Western Power at War 56
Reports on utility construction in 1943, with estimates for 1944.

A Million and a Half Kilowatts For Sale 76
Utilization men tell how the industry plans to tackle the postwar sales job.

Electronics at Work in Industry 94
By E. W. Morris—This article tells how the Ignitron has furnished the electronic key to fast, uniform resistance welding.

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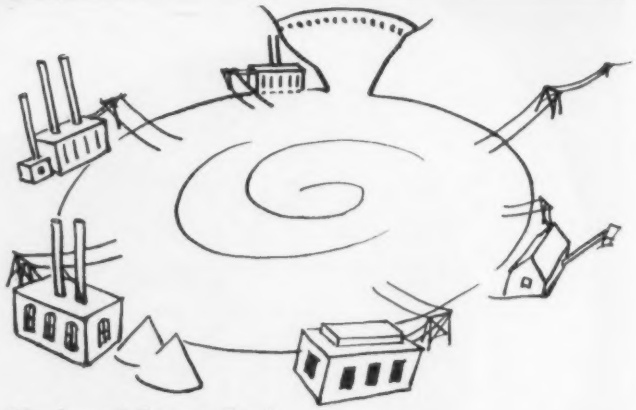
Cover—This dramatic photo of oil circuit breakers serving a synthetic rubber plant in Los Angeles was taken by George de Gennaro, photographer for the Los Angeles Department of Water & Power. A feature of the station is substitution of wood for steel in rack construction.

Preview



Northwest Power Pool

Paul Bunyan, mythical giant of the north country, as fantastically huge as all of his exploits were, is outstripped in the magnitude of the accomplishment for the war effort and the people of the West that is represented in the Northwest Power Pool. Its story, though told in engineering simplicity and with a rigorous adherence to facts as it will be next month, is real drama. No matter whether one is an engineer or not, he will want to read the very understandable and complete story of that proof that democracy accomplishes in this country what duress cannot in the realms of the enemy. Private, municipal and federal power systems forgot politics and put everything they had into the pool to make war production hum.

Anniversary

of Underwriters Laboratories is being quietly celebrated this year for the unique nonprofit and non-commercial testing organization is busier

than it has ever been in its 50 years of existance. It is doing its utmost to check fire safety for the Army and Navy and other government agencies. Next month will be told the story of the San Francisco laboratory of the Underwriters.

STEP UP

...Motor and Lighting Performance!

THAT BANK of three Allis-Chalmers Dry-Type Transformers, below, assures *better* voltage regulation, *lower* line losses in a large west coast shipyard.

The units are installed *right next to* the equipment they serve, yet they're up . . . *out of the way.* A long run of heavy secondary copper was saved. Man-hours and money were saved . . . because fireproof vaults weren't needed. There is no insulating liquid to test, filter or change . . . saving on maintenance. And because these drip-free units go up anywhere — on posts, beams, platforms, etc. — valuable floor space is saved!

Allis-Chalmers Dry-Type Transformers are ready for quick shipment *now.* For details, see our nearby district office. Or write, ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

A 1692

These Units Ready for Quick Shipment—Now!

CHECK THESE TRANSFORMER FEATURES:

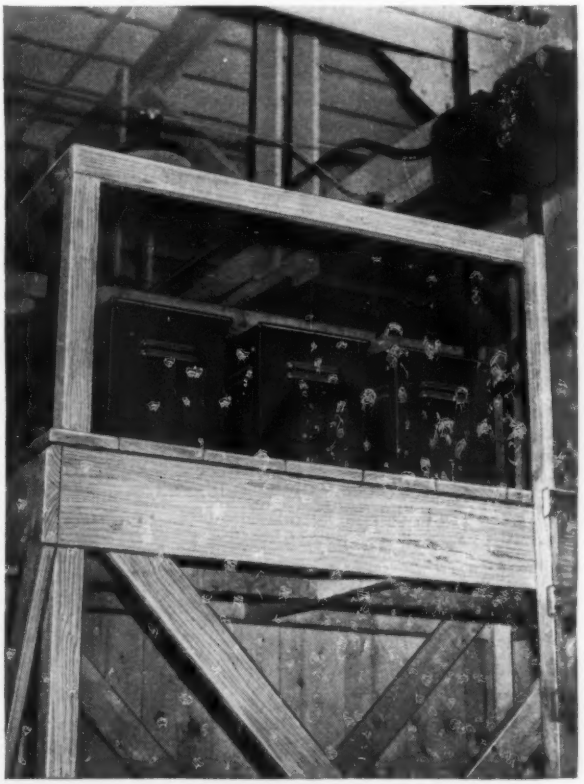
Smaller, Adaptable Size — permitting quick, easy changeover.

Easy-To-Get-At connections and knockouts; fast installation.

Windings Separated by solid insulation — meet safety requirements for inside buildings.

Coils Heavily Impregnated — rendering windings resistant to moisture.

Wide Range of Sizes — 1½ to 500 kva, single and 3-phase, with incoming voltages up to 15,000 v.



ALLIS-CHALMERS DRY TYPE TRANSFORMERS

Results of FRIGIDAIRE GOOD-WILL BUILDING PROGRAM foreshadow bigger things to come

★ **THE STORY of a Wartime Plan which we sincerely believe is helping both the Public and the Frigidaire Dealer Organization.**

OUR OBJECTIVES

1. To cooperate with important Government programs.
2. To provide a real and needed service, not only to the millions of Frigidaire users, but also to the users of all other refrigerators.
3. To help keep the name Frigidaire before the public in a way that would be *favorably* remembered.
4. To help Frigidaire Dealers build good will and maintain their identity with the Frigidaire business.

THE PROGRAM

1. Consistent advertising in leading women's magazines.
2. Activities offering materials and other help to home economists and others for classes and study groups.
3. A simple, practical handbook on the use and care of a refrigerator, entitled "Wartime Suggestions".
4. A motion picture for group use entitled "How to Get the Most out of Your Refrigerator."
5. Effective dealer helps and campaign information.

WHAT DEALERS DID

Frigidaire Dealers built good will by—

- Giving Wartime Suggestions booklets to store visitors; mailing them to customers; leaving them on service calls.
- Arranging with thousands of Teachers, Red Cross, Group Leaders, County Agents, and many others to use the General Motors motion picture, and distribute books to these groups.
- Tying in the program with War Bond, Cooking School and similar activities in their stores.
- Distributing books through Boy and Girl Scouts, Ration Boards, Groceries and in many other ways.
- Featuring Frigidaire's helpful messages and booklets in attention-getting displays, and in their newspaper, radio and direct mail advertising.

THE RESULTS

- Over 245 million advertising messages attracting an unusually high percentage of women readers, have helped keep the public reminded of Frigidaire Products and Frigidaire Dealers.
- More than 6¾ million "Wartime Suggestions" booklets required to meet requests—more than 5¾ million of these distributed through Frigidaire Dealers.
- More than 625,000 booklets and 250,000 reprints of advertisements requested by Home Economists and group leaders.
- The free Motion Picture "How to Get the Most out of Your Refrigerator" has been seen by thousands.
- Hundreds of expressions of interest and appreciation have been received from Government agencies, Educators, Home Economists, Dealers and the public.

Watch for '44 Announcement!

It is on this foundation that Frigidaire has built a new and enlarged program for 1944. Watch for the announcement!

For Excellence ARMY E NAVY *in War Production*

FRIGIDAIRE
Division of
GENERAL MOTORS
DAYTON 1, OHIO, AND LEASIDE, ONTARIO
Peacetime builders of
ELECTRIC REFRIGERATORS • RANGES • WATER HEATERS
HOME FREEZERS • ICE CREAM CABINETS
COMMERCIAL REFRIGERATION • AIR CONDITIONERS
BEVERAGE, MILK, AND WATER COOLERS

Listen to
GENERAL MOTORS SYMPHONY OF THE AIR . . .
Every Sunday Afternoon, NBC Network

★

LET'S ALL BACK THE ATTACK! BUY EXTRA WAR BONDS!

★

TALKING DISTANCE...OVER 5 MILES...
Laytex Assault Wire assures clear, sure transmission of messages—a prime military requirement for battlefront communications. An invaluable property when advance scouts have been cut off from their company and virtually surrounded in enemy territory.

LAYTEX ASSAULT WIRE IS LIGHTWEIGHT
...and fully dependable. One man carries enough wire to keep communications open—travels fast and far without being hampered by excess, needless weight.

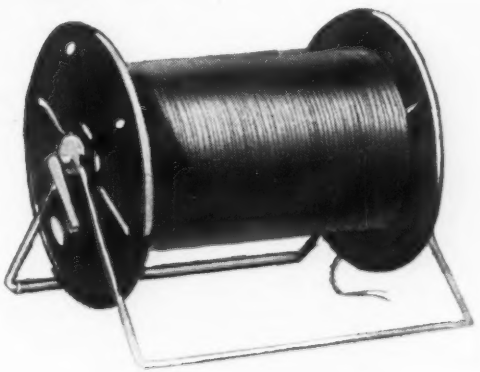
JUNGLE DAMP'S A KILLER

The jungle's a dirty fighter. Vines and underbrush seem to grow across your way while you watch them. The sun doesn't get through...and it's damp. The heavy, hot kind of damp that means mildew and decay to every piece of equipment not specially made or treated to resist them.

Laytex Assault Wire is specially made to resist damp. The high quality, uniform insulation is entirely free from water-soluble elements. It is unaffected by prolonged exposure to moisture, provides maximum protection to the accurately centered conductors.

Not only that...the special Laytex Insulation has high resistance to concussion and does not become embrittled when wire is subjected to repeated vibration and shock. It readily withstands temperature changes. Its uniformly high quality permits the thickness of the insulation to be kept at the minimum. As a result, Laytex Assault Wire is extremely lightweight. A mile weighs less than 30 pounds. Laytex Assault Wire has a talking distance of better than 5 miles, and was developed for front line service by United States Rubber Company scientists working in close cooperation with engineers of the Army Signal Corps.

These same properties—light weight, small diameter, ability to withstand temperature changes, flexibility and toughness make other types of Laytex Wires and Cables as important in peacetime industry and building as they are to the Armed Forces.



Laytex
ASSAULT WIRE

SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

1230 Sixth Avenue, Rockefeller Center, New York 20, New York

Postwar Planning is

"Planned Electrical Merchandising"

SIMPLIFIES IT FOR YOU

Bulletin No. 3, now ready, is titled: *Planning Your Type of Appliance Business.* This, like the others, makes postwar planning less formidable, less mysterious. For it's just good basic common sense when explained like ABC by Chas. Low, eminent retailing authority, the author of this series.

One Purpose Only—to Help You. These bulletins are about *your* business, *your* store, *your customers,* right in *your* community—not about Hotpoint products. They're full of practical, field-tested ideas to help increase your business.

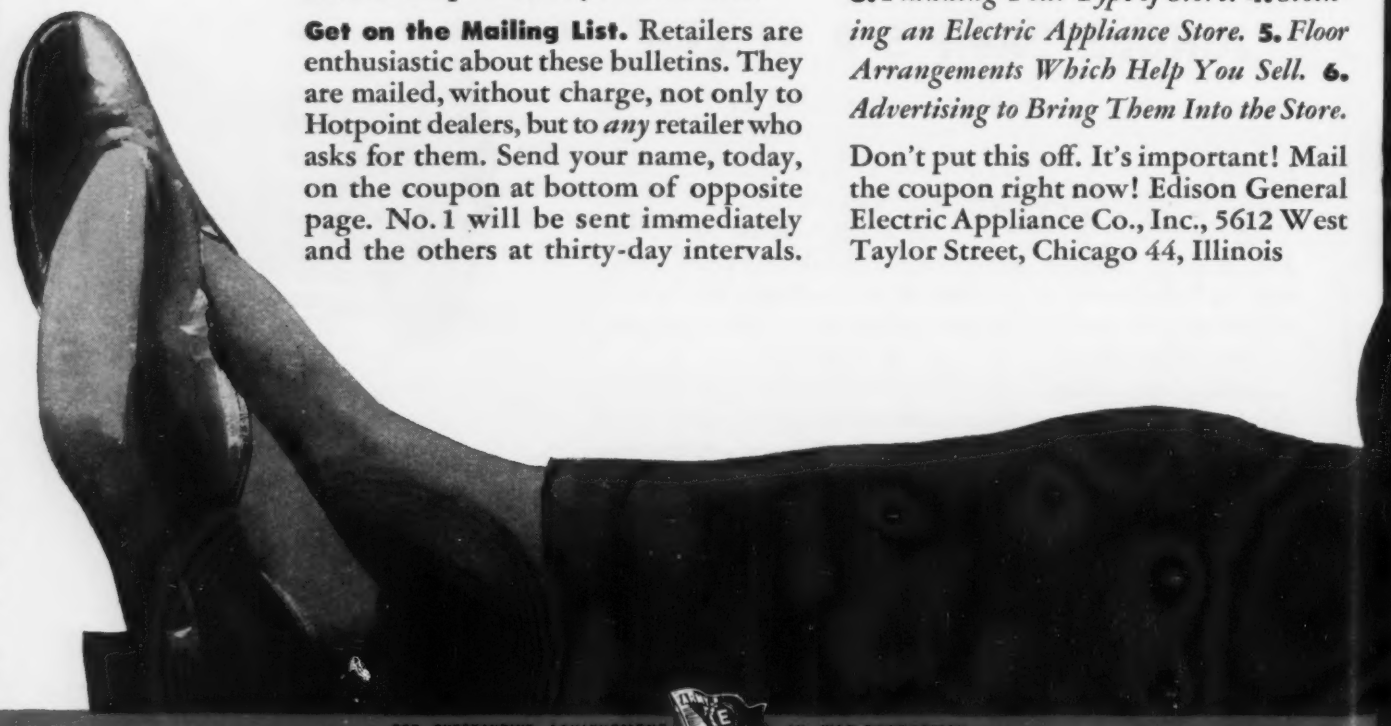
Get on the Mailing List. Retailers are enthusiastic about these bulletins. They are mailed, without charge, not only to Hotpoint dealers, but to *any* retailer who asks for them. Send your name, today, on the coupon at bottom of opposite page. No. 1 will be sent immediately and the others at thirty-day intervals.

Give Yourself This Advantage. Be armed for peace. The retailer who is best prepared, with sound knowledge about store location, secrets of display, making customers buy, etc. will have things his own way in the postwar period.

Subjects to be Covered. Here are the titles of the first six bulletins, which give a good idea of their contents.

1. *Plan Now for the Appliance Store that Will Help You Sell.* **2.** *How to Choose a Good Location for an Appliance Store.* **3.** *Planning Your Type of Store.* **4.** *Stocking an Electric Appliance Store.* **5.** *Floor Arrangements Which Help You Sell.* **6.** *Advertising to Bring Them Into the Store.*

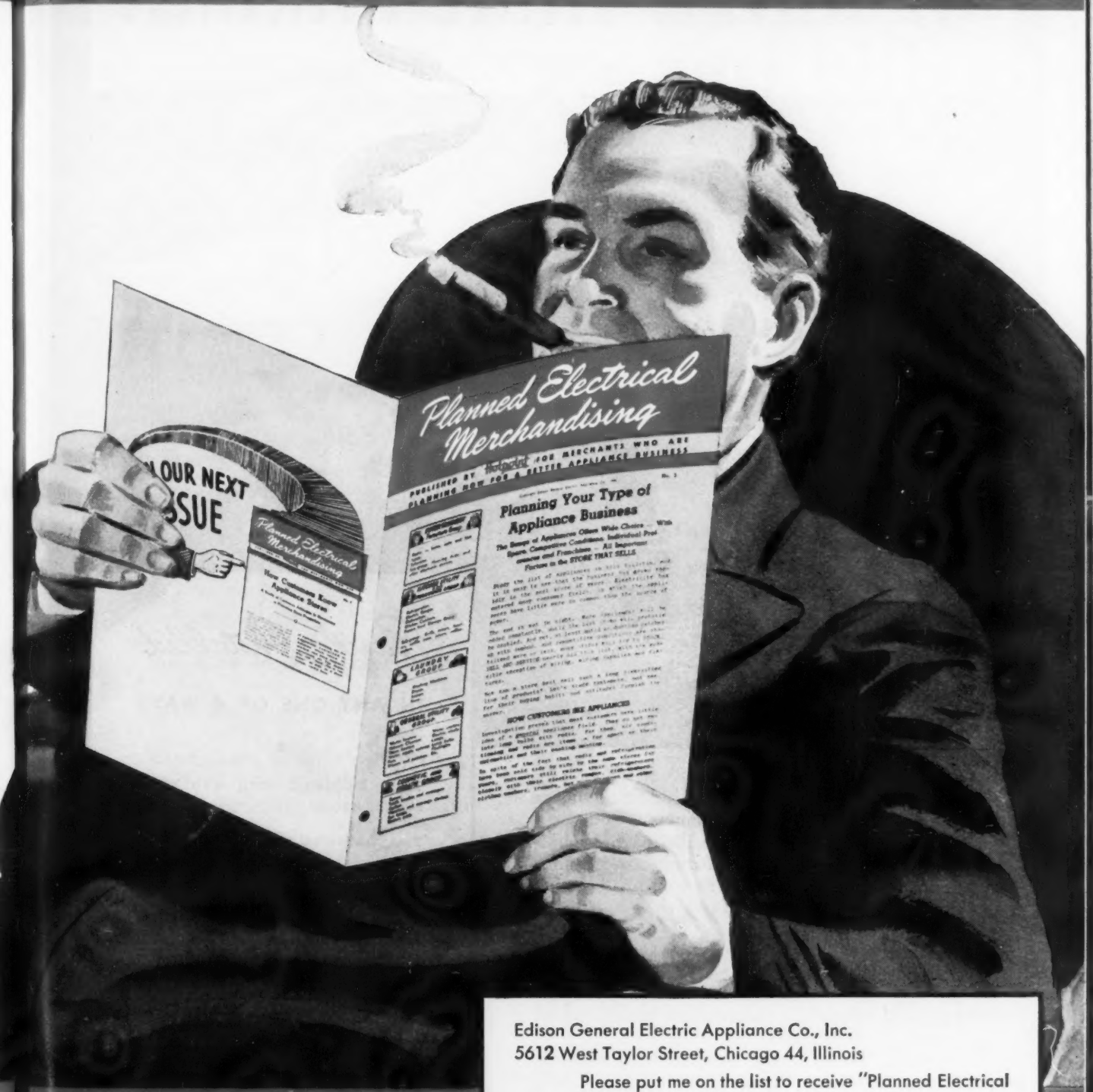
Don't put this off. It's important! Mail the coupon right now! Edison General Electric Appliance Co., Inc., 5612 West Taylor Street, Chicago 44, Illinois



FOR OUTSTANDING ACHIEVEMENT IN WAR PRODUCTION

ELECTRIC **Hotpoint** KITCHENS

easier than it sounds


Planned Electrical Merchandising
FOR MERCHANTS WHO ARE PLANNING NOW FOR A BETTER APPLIANCE BUSINESS
Planning Your Type of Appliance Business
OUR NEXT SSUE
Planned Electrical Merchandising

Pin this coupon to your letterhead and mail today

Edison General Electric Appliance Co., Inc.
5612 West Taylor Street, Chicago 44, Illinois

Please put me on the list to receive "Planned Electrical Merchandising" Bulletins.

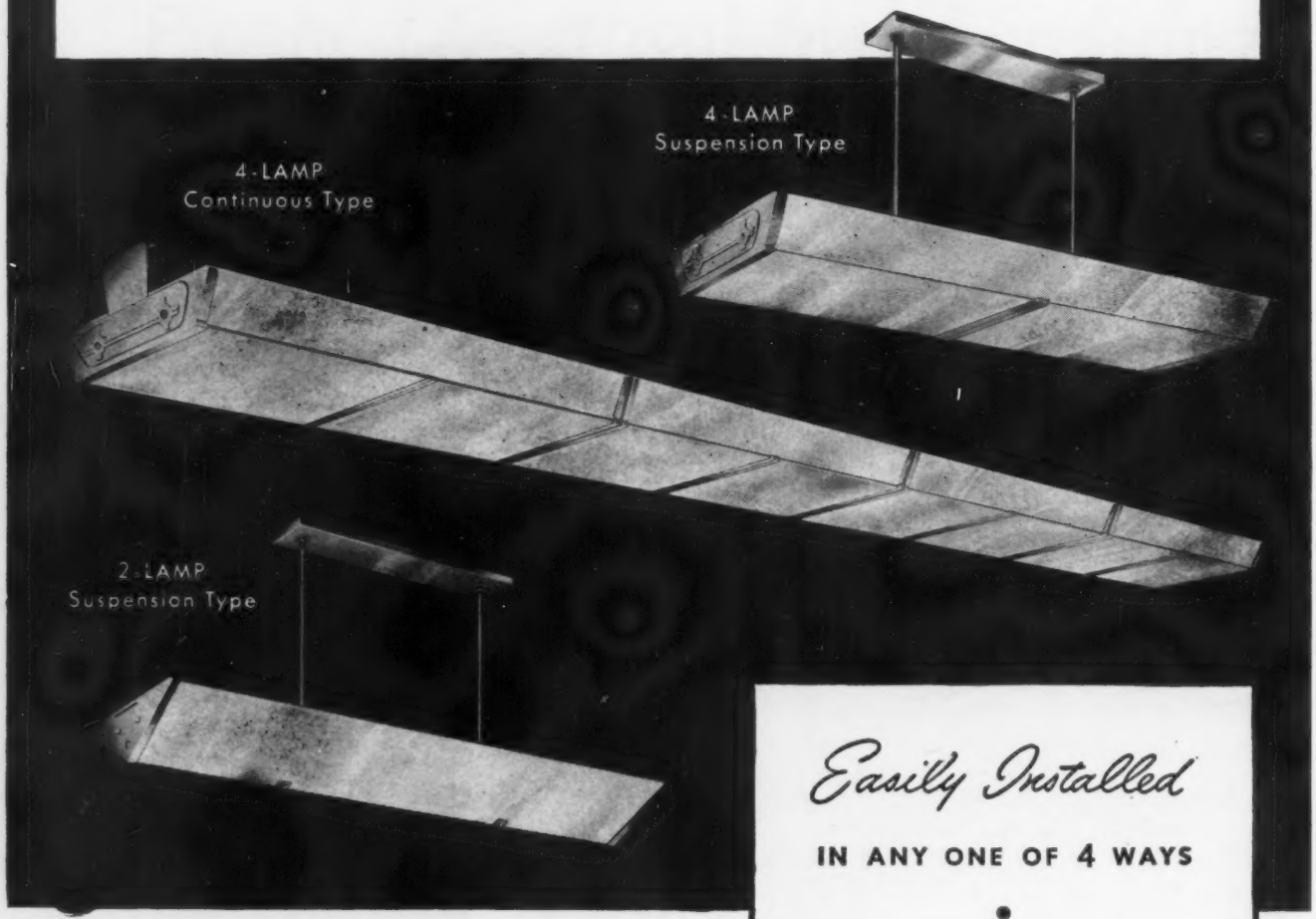
Name _____ Title _____
Owner, Manager, etc.

Firm Name _____

Address _____
Street City State

New! FLUORESCENT Luminaires

FOR ESSENTIAL WARTIME APPLICATIONS



For better illumination of war-production offices and drafting rooms, Westinghouse introduces a new line of Commercial-type, Fluorescent Luminaires. Used as individual fixtures or for continuous strip installations, they furnish a wide range of high intensities . . . and without shadows or glare.

Handsome in appearance and sturdily built, these efficient luminaires are *now* available through 117 Westinghouse Electric Supply Company offices and Independent Westinghouse Lighting Distributors.

Get full details today! Or write Westinghouse Electric & Mfg. Company, Edgewater Park, Cleveland, Ohio, for bulletin B-3332.

Easily Installed

IN ANY ONE OF 4 WAYS

1. As individual units, with twin-stem hangers.

2. As individual units, mounted flush with the ceiling.

3. For continuous strip applications, with twin-stem hangers.

4. For continuous strip applications, mounted flush with the ceiling.

Westinghouse Commercial-type Fluorescent Luminaires are available with or without the glass panels illustrated above.

Westinghouse *Lighting Equipment*

PLANTS IN 25 CITIES OFFICES EVERYWHERE

Tune in John Charles Thomas, NBC, Sundays, 2:30 P.M., E.W.T.

JOB PROVED
in thousands of installations

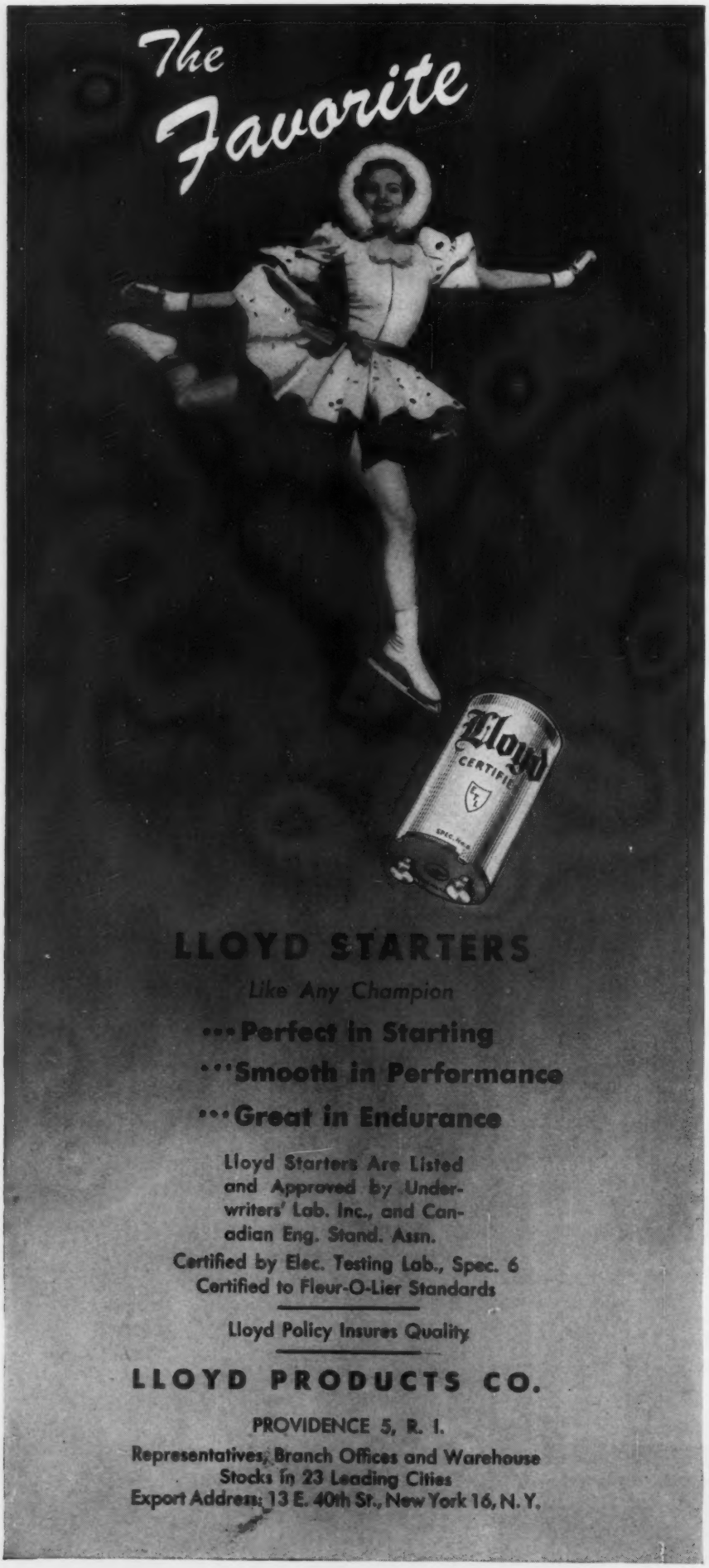
Central Rigid Steel Conduit will give long reliable service even under the most difficult conditions. Practical experience in thousands of installations has proven this time and again.

SPANG-CHALFANT

Division of The National Supply Company

Executive Offices:
Grant Building, Pittsburgh, Pa.

District Offices and Sales Representatives in Principal Cities


The Favorite
Lloyd
CERTIFIED
LLOYD STARTERS
Like Any Champion
•••Perfect in Starting
•••Smooth in Performance
•••Great in Endurance
Lloyd Starters Are Listed and Approved by Underwriters' Lab. Inc., and Canadian Eng. Stand. Assn.
Certified by Elec. Testing Lab., Spec. 6
Certified to Fleur-O-Lier Standards
Lloyd Policy Insures Quality
LLOYD PRODUCTS CO.
PROVIDENCE 5, R. I.
Representatives, Branch Offices and Warehouse Stocks in 23 Leading Cities
Export Address: 13 E. 40th St., New York 16, N. Y.

BOOKS

you may want

PATENT LAW, by Chester H. Biesterfeld, 225 pages, 5½x8½, John Wiley & Sons, $2.75. This book offers a unique treatment of each of the principal subjects of the substantive patent law supported by citations and quotations taken from court decisions. Previous legal knowledge is not needed for a clear comprehension of the contents which cover, among other things, the subjects of infringement, functional claims, double patenting, abandonment, permissible breadth of chemical claims, joint ownership of a patent, assignment and recording, price fixing, trade secrets, patent litigation and searches.

Simple, everyday language is used throughout. Legal terms that might mystify the "layman" are clearly explained and each basic principle or rule underlying essential subjects of patent law is carefully discussed. Citations of leading cases, with a quotation from a pertinent section, are given to illustrate the point in question.

The book contains an excellent subject index and a table of cases cited which enables quick and easy means for later reference to the desired section. There is also a bibliography for those who wish to pursue further the subject of patents in a more detailed way. The book should find ready acceptance by chemists, engineers and students who may be confronted with the questions of patent law and practice arising out of research and technical work.—E. A. C.

A PRIMER OF ELECTRONICS, by Don P. Caverly, 235 pages, index, well illustrated, 5½x8, McGraw-Hill Book Co., $2. This is one of the many new books dealing with some phase of electronics and, as the name implies, it is written for those with little or no previous knowledge of the much heralded subject of electronics.

The book begins with a clear and simple explanation of the electron theory and in succession deals with electric current, magnetism and electromagnetic radiation. A large colored chart giving range of the electromagnetic radiation shows the whole vibratory system starting with the frequencies and wave lengths of subsonic vibrations and ordinary alternating-current for light and power use, on up through the whole gamut of wave lengths to cosmic rays and the creation of matter. The theory of simple vacuum tubes, fluorescent lamps, cathode ray tubes, the Ignitron, thyraton and other tubes is explained and their basic connections and practical applications given.

With present-day interest in electronics the book gives those seeking fundamental knowledge some conception of what electronics is all about and a background upon which to go on into specialized applications.

HOW TO MAINTAIN ELECTRIC EQUIPMENT IN INDUSTRY, General Electric Co., 372 pages, 8½x11, $1.75. Anybody ought to be able to fix anything in industrial electrical equipment, so ingenious and simple and practical is the arrangement of the contents of this maintenance manual. In 24 sections, each a booklet in itself, each section contains general information, a preventative maintenance schedule, advice on when to recondition, and specific trouble shooting procedure arranged in easy chart form which indicates the trouble, cause, and

(Continued on Page 14)

This electrical cable resists:

HEAT

ACIDS

OILS

MOISTURE

Okolite-Okoprene cables successfully meet the hazards of industrial plant operation. Insulated with Okolite and protected by an Okoprene* sheath, they are heat resistant and can be used in circuits running near blooming mills, furnaces, soaking pits, boiler rooms, steam lines and pouring ladles. Resistant to the solvent action of grease and oils, Okoprene is not deteriorated by the cutting oils used on pipe-threading machines or by lubricating oils from cold-rolling mills. Acid problems existing near pickling and plating tanks are overcome by Okoprene. Over and above this the toughness, flexibility and abrasion resistance of the Okoprene covering mean unexcelled ability to withstand mechanical abuse.

Okolite-Okoprene cables are made in a full range of capacities, and sizes for all electrical applications. Write for Bulletin OK-2009C. The Okonite Company, Passaic, N. J.

* A neoprene protective covering developed by Okonite for severe applications. Resistant to moisture, flame, oil and sunlight, Okolite-Okoprene cables can be installed in ducts, buried directly in the earth, or exposed to the elements—**without additional protection.**

U.S. Pat. 2,312,058

3396

Okolite-Okoprene

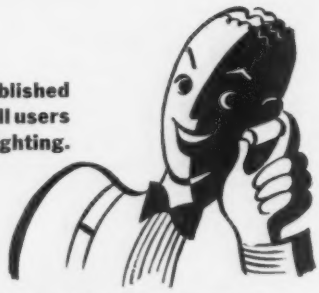
THE OKONITE COMPANY

INSULATED WIRES AND CABLES

OKONITE

Fluorescent operating hints

No. 1 of a series published by Sylvania for all users of fluorescent lighting.



HOW TO TEST LAMPS AND STARTERS

If a fluorescent lamp blinks or fails to light early in life, it does not necessarily indicate premature lamp failure. The trouble may be a defective ballast or a faulty starter. However, the first thing to do is to replace both the lamp and the starter with units known to be satisfactory. If the new lamp fails to operate with the new starter in place, loose connections in the wiring or ballast may be the reason, and the electrician should check the entire circuit.

To check the questionable lamp and starter that have been removed, test them in a fixture known to be performing properly, or return them to the maintenance shop for checking on a simply constructed test board.

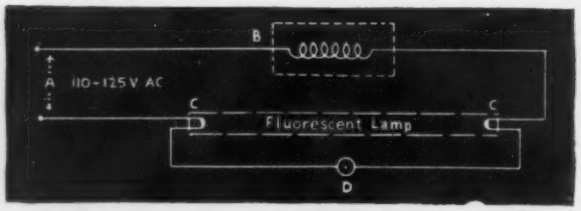


Figure 1

HOW TO MAKE TEST BOARD

Fig. 1 shows the wiring for a simple test board that can be used to check either lamps or starters. *A* is the connection to the 110-125 volt AC line. *B* is a single-lamp ballast of the same wattage rating as the lamp being tested in *C*, the lamp sockets. *D* is the starter socket.

Fig. 2

DUMMY-STARTER TESTER

For use with this test board, you can make a dummy-starter tester from a spare or used Sylvania starter by removing the can and connecting the two contacts permanently, Fig. 2. Replace the can and scratch it with a distinctive mark, so that it will not be mistaken for one of your regular starters.

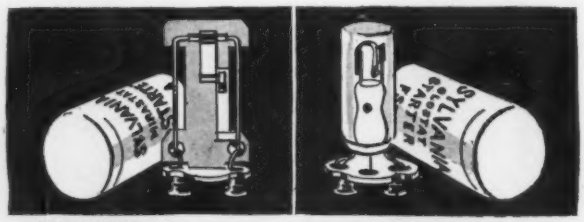
TESTING THE LAMP

Place the lamp to be tested in lamp sockets *C*, and place the dummy starter in socket *D*. If the lamp is good, both ends of it will glow when the dummy starter is in the socket; and the entire lamp will light when the dummy starter is *quickly* removed. If the lamp does not perform in this way, it is worn out and should be discarded.

HOW TO TEST STARTER

To test starters on the test board, put a lamp known to be good in sockets *C*, and put the questionable starter in socket *D*. If the starter is good, the lamp will light in less than 30 seconds.

(*CAUTION*: Test No. 2 starters with 15- or 20-watt lamps only; No. 4 starters with 30- or 40-watt lamps only; No. 5 starters with 6- and 8-watt lamps only; No. 6 starters with 100-watt lamps only; and No. 7 starters with 65-watt lamps only.)



MIRASTAT—Sylvania's thermal-type starter

GLOSTAT—Sylvania's glow-type starter

STARTERS ARE LAMP-LIFE INSURANCE

The fluorescent lamp starter is an automatic time-delay switch. Mechanically rugged, it enables the fluorescent lamp to establish its lighting arc without the use of high voltage.

Starters cost only a few cents — but they protect your really important investment in fluorescent fixtures and fluorescent lamps. Defective starters shorten lamp life and cause overheating in ballasts. It pays to test your starters and replace defective ones with Sylvania Mirastats or Glostats.

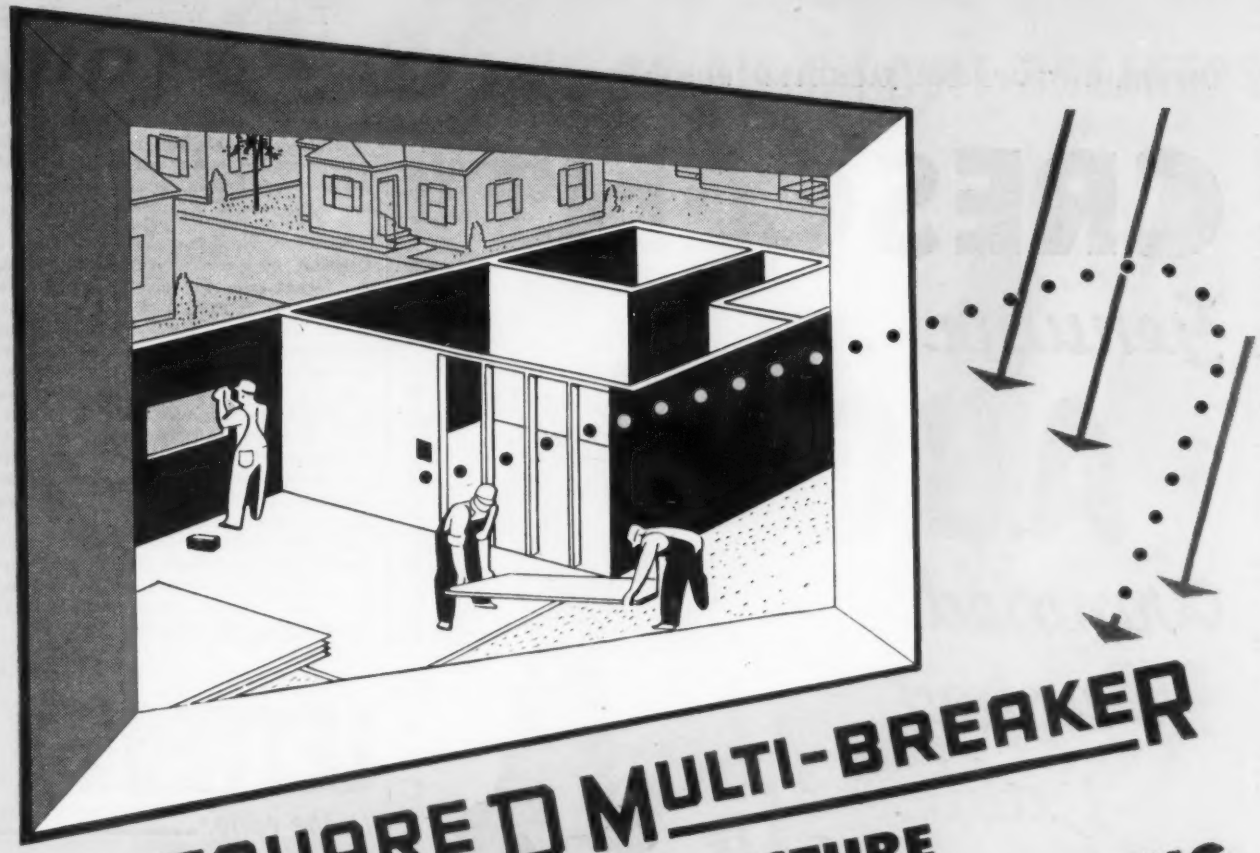
For Additional Maintenance Information

Send for this Free Booklet

☆ **SYLVANIA** ELECTRIC PRODUCTS INC.

SALEM, MASS.

INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES, RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES



THE SQUARE D MULTI-BREAKER FITS INTO EVERY PICTURE OF MULTIPLE HOUSING

large units — small units — prefabricated or otherwise

WHETHER it's a small group of cottages or a planned community, complete from homes to schools, stores and churches, there is a Square D Multi-breaker installation to fit the picture . . . exactly.

The annnoyance of changing fuses simply isn't in keeping with tomorrow's scheme of things—especially since Multi-breaker convenience and protection costs little more than the fusible equipment it replaces—often actually less.

Your nearby Square D Field Engineer will be glad to work with you in arriving at the best electrical specifications for any project you are planning. His knowledge and experience may prove most profitable.

Currently, every Multi-breaker we produce is assigned to wartime service. But the same features which make it so valuable to the war effort, earn it a place in the homes which will be built in the future.

The Multi-breaker eliminates fuses completely. When a short circuit or dangerous overload occurs, the circuit is cut off automatically. A simple movement of the shockproof lever restores current. There are no delays—nothing to replace.

ELECTRICAL EQUIPMENT • KOLLSMAN AIRCRAFT INSTRUMENTS

SQUARE D COMPANY

LOS ANGELES 21 • SAN FRANCISCO 3 • DENVER 4
DETROIT • MILWAUKEE

• IMPERIAL NEOPRENE JACKETED PORTABLE CABLES •

CRESCENT

Genuine

A.B.C.

Armored Bushed Cable

NOW AVAILABLE

CONDUCTORS—flame retarding, printed showing size, type of insulation and voltage.

INSULATING BUSHING—easy to insert, as paper unwraps from under *both* ends of armor to make room for the bushing.

STEEL ARMOR—Low resistance, electrogalvanized for permanence.

Thoroughly tested at several stages of manufacture, and receiving a final test of 2000 volts between conductors and armor.

CRESCENT has unexcelled facilities for the complete manufacture of Armored Bushed Cable in all its steps. When you buy CRESCENT A.B.C. ARMORED BUSHED CABLE you buy the best. Do not be satisfied with any substitute.

CRESCENT INSULATED WIRE & CABLE CO.

CRESCENT

WIRE and CABLE

Factory: TRENTON, N. J.—Stocks in Principal Cities

• RUBBER POWER CABLES • VARNISHED CAMBRIC CABLES •

• ARMORED CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • BUILDING WIRE •

• PERMACORD • LEAD-ENCASED AND PARKWAY CABLES • SYNTHOL WIRES • WELDING CABLES • SHIPBOARD CABLES •

remedy in parallel columns. It is profusely illustrated with many new tables, hitherto unpublished charts, all indexed in such a way as to make use of the information. There are no more words than absolutely necessary and they are in the language of the maintenance engineer.

LIGHTING HANDBOOK, Westinghouse Lamp Division, Bloomfield, N. J., 175 pages, 5x7½-in. pocket size, $1. Containing a series of charts which coordinate the room index, fixture efficiency and coefficient of utilization curves and provide a new and graphic method of determining the desired illumination for various applications, this compact handbook sweeps the field of illumination from eyesight conservation through terms, measurements, light sources, designs, levels, calculations, wiring and various applications, and ending with costs. Its charts cover industrial and commercial fluorescent and incandescent lighting and provide calculating means for number and size of lamps needed, with practically every type of lighting fixture. It is extensively illustrated by simple line drawings and concisely written.

LETTERS

to the editor

To the Editor:

On page 69 of your December issue, under *Reasonable Guarantees*, there was presented a talk at a recent PCEA meeting in Los Angeles, in which I have been seriously misquoted . . .

In the talk I definitely stated that I would not only present a manufacturer's viewpoint but that of a customer of electrical appliances and further said that everyone in the room could work on the problem of guarantees from two viewpoints—that of their own particular endeavor, whether it be a manufacturer, distributor or utility, and that of a customer. I felt the public had become tired of being kidded by fine print and big words in a guarantee that really didn't mean anything; that the competition coming from one of the large chain stores was "satisfaction guaranteed or your money back."

I did not stress, but mentioned that the utility companies have a responsibility in the guarantee of a product as far as furnishing service is indicated—that is reasonable voltage regulation. In the case of water companies, it would mean to prevent pressure surges by the use of proper control methods.

I did not say that switches were not guaranteed, but implied that a product often breaks down because of a part, such as a switch, and that the parts manufacturers are just as responsible for the over-all use of that product to the customer as the final assembler is. You might say that the final assembler should get another switch manufacturer, but unfortunately they all are about together on their furnishing of defective parts.

I do not remember saying particularly that customers needed proper instruction but distributors and dealers needed proper instructions so they could pass the information along to the customer.

W. E. CRANSTON
Thermador Electrical Manufacturing Co.
Los Angeles, Calif.

ANNOUNCING A NEW LINE OF OIL CIRCUIT BREAKERS

★
smaller size
★
faster opening
★
lower prices
★

...115 kv and above with 5 cycle opening time

To improve system stability on loaded, high voltage power lines, Westinghouse announces a new, smaller, faster opening, and lower priced GM breaker with 5-cycle opening time.

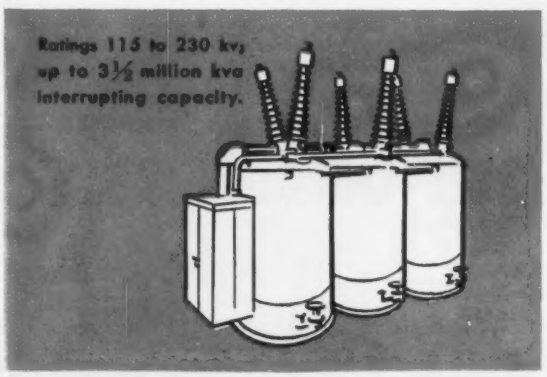
SMALLER than the 8-cycle breakers they supersede, these new breakers require less oil and oil handling and smaller foundations.

FASTER 5-cycle opening time on breakers 115 kv and above represents a standard feature long requested by users . . . it improves system stability.

LOWER PRICED than the breakers they replace, the new line represents the greatest breaker value ever offered by Westinghouse.

For complete information, call your nearest Westinghouse office. Or write Westinghouse Electric & Manufacturing Company, Dept. 7-N, East Pittsburgh, Pa. Ask for bulletin DD-33-805.

J-60543



NEW
Type GM
5-cycle opening time

OLD
8-cycle opening time

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

Circuit Breakers

STOCKS FROM 8 *Great Factories* UNDER ONE ROOF...

For your Electrical Production and Maintenance Needs

A PARTIAL LIST OF ELECTRICAL ITEMS AVAILABLE AT TRI-STATE

- Essex Flexible Lead Wire
- Superior Cotton Sleeving
- Superior Cotton Tape
- Vartex Varnished Cambric
- Taylor and Copaco Slot Insulation
- Dieflex Varnished Tubing
- Taylor Phenolic Fibre
- Mica Segments and Rings
- Ohio Carbon Brushes
- Homer Commutators
- Neatpak Solder
- Dielectric Friction Tape for General Use
- Trico Armature Twine
- Trico Slot Wedges
- Banding Wire
- Trico Crepe Insulation
- Essex Magnet Wire
- Case Pressboard
- Scotch Flat Back Electrical Tape
- Bunting Motor Bearings
- Pedigree Varnish and Sealers for Over-All Windings in Electrical Field Coils and Armature Windings.

Tri-State Supply Corporations represent eight large factories manufacturing a wide range of electrical equipment. Assembled under one roof, you will find wiring, winding necessities and vital parts for motors, generators, starters, transformers and relays; insulated wire of many types, commutators, brushes, resistors, varnishes, insulating tapes and paper, fibre, bearings and cambric insulation.

Tri-State can help you solve the problem of delivery by furnishing application and engineering data, by helping anticipate future requirements and by expediting actual deliveries.

Wire or phone today for more details of Tri-State services and how they can be put to work for you.

NOW AT 3 KEY LOCATIONS

TRI-STATE SUPPLY CORPORATIONS

LOS ANGELES
544 S. San Pedro St.
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318 Occidental Ave.
MA 7146

YOU WILL SAVE

countless $4.50's by installing KYLE CIRCUIT BREAKERS at strategic locations in your distribution system

Every time your service truck makes a trip to replace a blown fuse, it costs $4.50 or more, depending on the distance traveled and the time involved.

With today's personnel problems, every unnecessary trip must be eliminated no matter what the cost.

Kyle Oil Circuit Breakers in your distribution system will eliminate 85% of these expensive service calls, save hours of labor and assure continuity of service. Kyle Circuit Breakers do this by clearing all temporary faults . . . estimated at 85% . . . by their own automatic opening and hydraulic reclosing mechanism.

Kyle Circuit Breakers are easy to maintain. No motors or clockwork to get out of order. Kyle Circuit Breakers are triple safe to install and operate . . . normal position of the breaker is open . . . operating handle and tank is always dead . . . there is no terminal in the bottom of the tank. An automatic thermo-trip prevents damage to the breaker from overheating.

Kyle Circuit Breakers are so designed that each opening is fast and each closing requires an interval of three seconds. After the third opening, if the fault is still in existence, the breaker opens for the fourth time and LOCKS OUT. Then and then alone does it require manual operation for re-setting.

Think of what these Kyle dependable, automatic features can save . . . by keeping your system in continuous trouble-free service.

Ratings of the Kyle Circuit Breaker
Volts: 2300 to 15,000; Amperes: 3 to 50; Minimum Tripping Current: 8 to 102 amperes; Interrupting Rating: 120 to 2000 amperes; Weight: 135 pounds with oil.

KYLE

Automatic Reclosing OIL CIRCUIT BREAKER

KYLE CORPORATION
SOUTH MILWAUKEE, WISCONSIN

Kyle Oil Circuit Breakers are sold exclusively through all branch offices and Representatives of the LINE MATERIAL COMPANY Milwaukee, Wisconsin

J. J. Crouch
ALBUQUERQUE NORGE, INC.
Albuquerque, N. Mex.

Robert Hazer
THE ARNOLD WHOLESALE CORP.
Cleveland, Ohio

E. O. Hunting
THE AUTO EQUIPMENT CO.
Denver, Colo.

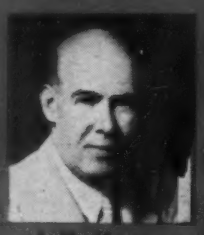
W. M. Wood
AUTOMATIC SALES CORP.
Houston, Texas

S. J. Levy
BERGMAN-NORGE CO.
Buffalo, N. Y.

E. D. Healey
BIRMINGHAM ELEC. BATTERY CO.
Birmingham, Ala.

B. S. Gambill
BRAID ELECTRIC CO., INC.
Nashville, Tenn.

F. M. Bultman
CAIN & BULTMAN, INC.
Jacksonville, Fla.



J. T. Morgan
CHARLESTON ELEC. SUPPLY CO.
Charleston, W. Va.

C. H. Clemons
CLEMONS BROS. CO.
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Eric Johnston
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Harry Knodel
THE HARRY KNODEL DISTR. CO.
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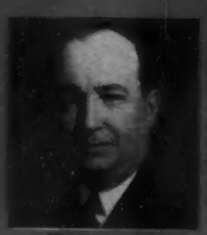


K. Connelly
F. B. CONNELLY CO.
Seattle, Wash.
Portland, Ore.

"Still Present or Accounted for!"

Working for today and planning for tomorrow, the Norge corps of independent distributors is still intact and looking forward to *a great future with Norge!*

*** * * * ON ACTIVE SERVICE * * * ***

To George Lehleitner, Walter Custis, P. F. Crenshaw, Jr., L. J. McAllister and B. H. Spinney, now in the service of our country, a salute from the Norge organization. To them and to the many other Norge men in the Services, good luck and an early homecoming.

It is from these men and their dealers that Norge often receives suggestions and opinions concerning postwar household appliances and postwar markets.

It is because of these men and their dealers that Norge began its postwar planning many months ago.

It is with these men and their dealers that Norge looks forward to an unusually bright future.

Success is assured. A postwar line of full-profit major appliances, all of them *products of experience* and all selling under one brand name, will be backed by vigorous national and local advertising.

Sales of the new line will be heightened by a wealth of practical, proved merchandising helps, gleaned through the activities of the Norge Jury of Marketing Opinion.

The well-known Norge policy of "fair treatment for all" will continue in effect, keeping Norge dealers in a position so favorable that they will remain the envy of the entire home appliance field.

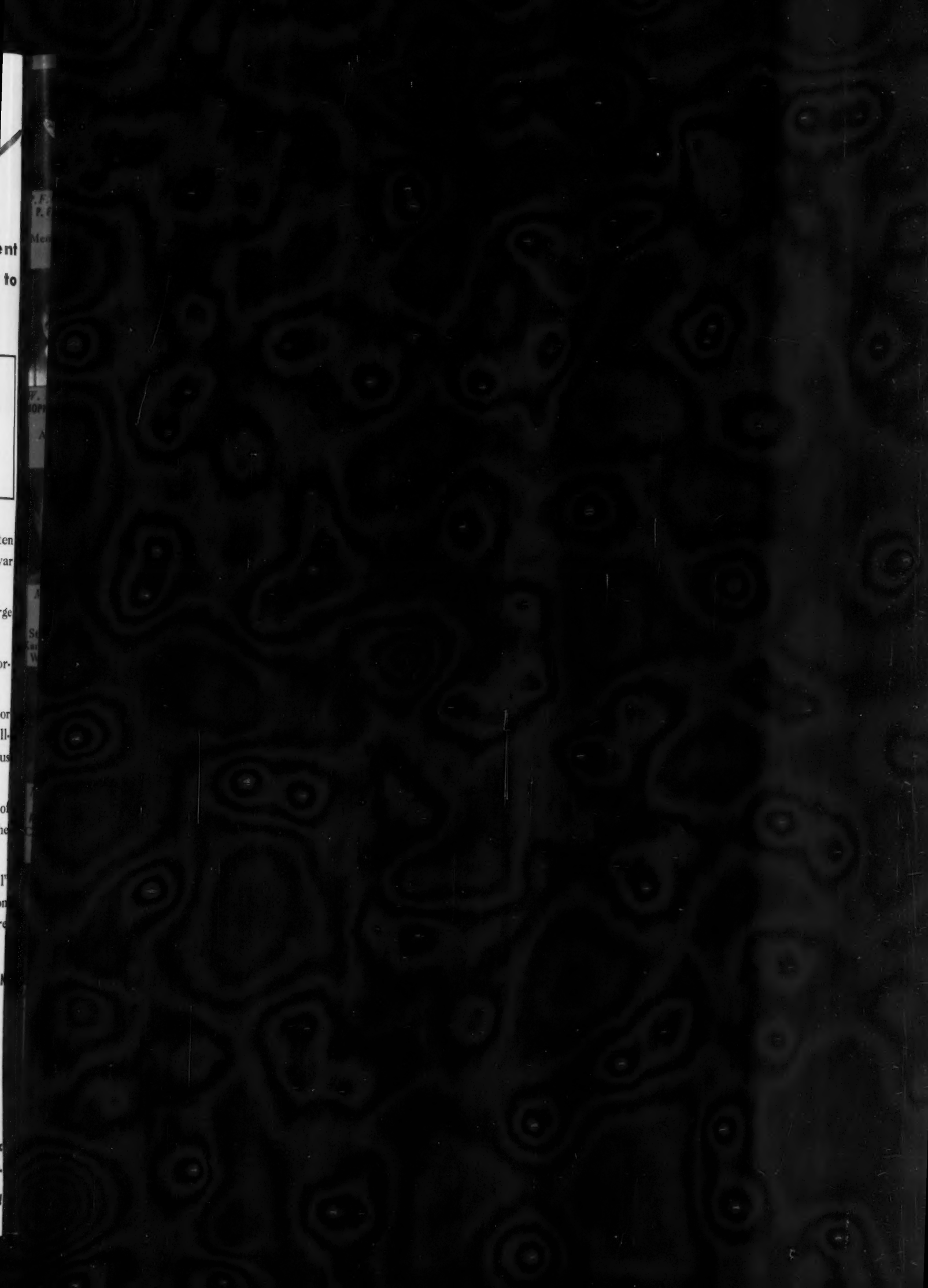
NORGE DIVISION, BORG-WARNER CORPORATION, DETROIT 26, MICHIGAN

NORGE

A BORG-WARNER INDUSTRY

Only prewar producer of a complete line of Rollator refrigerators, electric ranges, washers, gas ranges, home heaters, commercial refrigeration.

WHEN IT'S OVER, SEE NORGE BEFORE YOU BUY!



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ICHIGAN

electric
eration.

BUY!

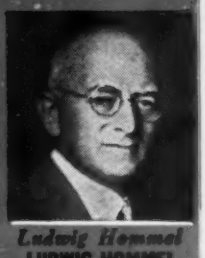
P. F. Crenshaw, Jr.
P. F. CRENSHAW, JR., CO.
Memphis, Tenn.

W. E. Seaton
DENL. T. CRUMP CO., INC.
Richmond, Va.

R. F. Healy
ERSKINE-HEALY, INC.
Rochester, N. Y.

C. Olesen, Jr.
THE FARRAR BROWN CO., INC.
Portland, Maine

J. M. Bloch
THE GIBSON CO.
Indianapolis, Ind.



Ludwig Hommel
LUDWIG HOMMEL & CO.
Pittsburgh, Pa.

W. D. V. Hopkins
HOPKINS EQUIPMENT CO., INC.
Atlanta, Ga.

H. P. Meyer
IMPERIAL HARDWARE CO., INC.
El Centro, Calif.

Geo. Lehleitner
GEO. H. LEHLEITNER & CO., INC.
New Orleans, La.

Frank Lyon
FRANK LYON CO.
Little Rock, Ark.

L. J. McAllister
L. J. McALLISTER CO.
Boston, Mass.

E. H. Krohn
ALBERT MATHIAS & CO.
El Paso, Texas

M. B. Lasky
MAYFLOWER SALES CO.
St. Louis, Mo.
Kansas City, Mo.
Wichita, Kans.

R. M. Dodds
A. Y. McDONALD MFG. CO.
Sioux City, Iowa

V. J. McGranahan
V. J. McGRANAHAN DISTR. CO.
Toledo, Ohio

William Mee, Jr.
WILLIAM MEE CO., INC.
Oklahoma City, Okla.

A. H. Meyer
LEO J. MEYBERG CO., INC.
San Francisco, Los Angeles, Calif.

C. A. Rahn
MIDLAND IMPLEMENT CO., INC.
Billings, Mont.

Mark Lintner
COLUMBUS APPLIANCES, INC.
Columbus, Ohio

W. C. Rowles
ROWLES SALES CO.
San Antonio, Tex.

Dave Burke
RADIO DISTRIBUTING CO.
Detroit, Mich.
Grand Rapids, Mich.

A. C. Reinhard
REINHARD BROS. CO., INC.
Minneapolis, Minn.
Aberdeen, S. Dak.
Fargo, N. Dak.

W. H. Roth
ROTH APPLIANCE DISTR., INC.
Milwaukee, Wis.

Chas. L. Wheeler
SALT LAKE HARDWARE CO.
Salt Lake City, Utah

Peter Sampson
SAMPSON ELECTRIC CO.
Chicago, Ill.

C. L. Carper
SIDLES CO.
Omaha, Nebr.
Des Moines, Iowa

J. H. Northey
SOUTHERN BEARINGS & PARTS CO.
Charlotte, N. C.

W. E. O'Connor
SOUTHERN WHOLESALERS, INC.
Washington, D. C.

B. H. Spinney
B. H. SPINNEY CO.
Springfield, Mass.
Albany, N. Y.
Syracuse, N. Y.

F. L. Wallace
SUMMERS HDWE. & SUPPLY CO.
Johnson City, Tenn.

Geo. Buechel
THE OUTCLIFFE CO., INC.
Louisville, Ky.

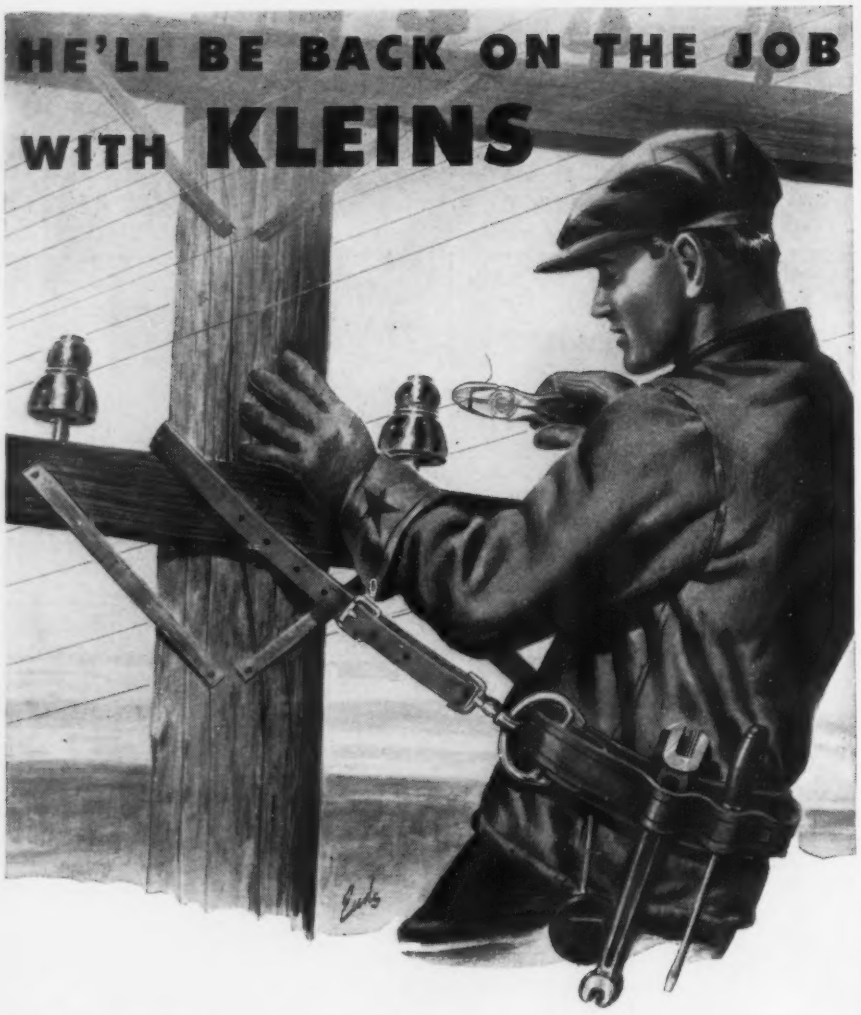
W. J. Schnelle
TEXAS WHOLESALERS
Dallas, Texas

T. S. Doyerle
THURMAN & BOONE CO., INC.
Roanoke, Va.

Dave Trilling
TRILLING & MONTAGUE
Philadelphia, Pa.

E. G. Turner
TURNER DEPT. STORE CO.
Springfield, Mo.

C. B. Warren
WARREN-CONNOLLY CO., INC.
New York, N. Y.



WHEN the war is won the planned program of communication and power line expansion will begin. The man on the pole will again be calling for Kleins.

He can be assured of the same high quality that has characterized the name Klein since the first wires were strung nearly a century ago.

Today, Klein production of pliers and tools, climbers and grips, safety straps and belts is greater than ever before. For this equipment is essential in keeping communication lines humming at home and on the battle front—in keeping power flowing to speed the world's greatest industrial production.

Tomorrow, public utility companies are assured that this stepped-up production will aid them in the important job ahead—providing better communications—greater power for an America at peace.

ASK YOUR SUPPLIER

Foreign Distributors:

International Standard Electric Corp., New York

Every broken tool is a break for Hitler! It is important that tools be properly used and properly cared for. The Klein booklet "Long Life to Tools" giving valuable information on the proper use and care of tools will be sent on request to anyone interested.

Since 1857

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
3200 BELMONT AVENUE CHICAGO 18, ILLINOIS

PRODUCTS

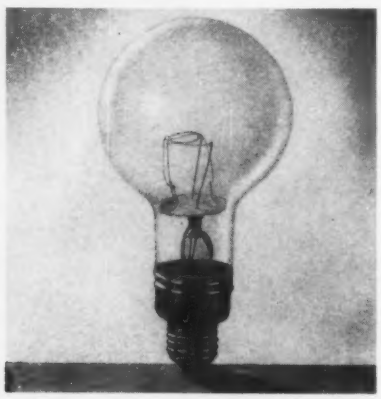
that are news

Polythene (200)

E. I. du Pont de Nemours & Co. has developed a new plastic, polythene, which it claims is adaptable for a variety of products ranging from insulation for electric wiring and cables to collapsible toothpaste tubes. Properties of the plastic announced by the manufacturer include: Flexibility and toughness over a wide range of temperatures; good resistance to water and to penetration by moisture; chemical inertness; and excellent electrical properties.

Although polythene is being manufactured in commercial quantities, it is stated that it is available in substantial quantities only by specific allocation for war purposes.

Infrared Heat Lamp (201)



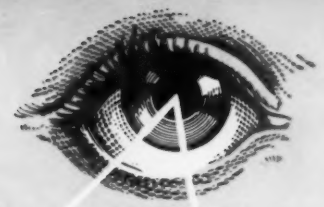
Wabash Appliance Corp. has an infrared heat lamp specially constructed to lock base and bulb against temperatures of infrared tunnel use. This new construction uses no cement or strap and includes a base lining made with special protrusions fitting tightly into indentations in the neck of the bulb and locked in position by special crimping of the metal base, the announcement states. A ceramic heat reflector disc replaces the mica disc formerly used.

Marble-Sized F Lamp (202)

A fluorescent lamp the size of a marble, and said to give off more light than a quarter-watt neon glow lamp consuming two and one-half times as much power, has been developed by Westinghouse engineers. The lamp consumes 1/10 watt and 30 of the bulbs take no more energy than an electric clock, it is stated.

This lamp contains two spiral electrodes in a gaseous atmosphere. A discharge takes place when about 100 volts a-c or 140 volts d-c is applied across the electrodes. This creates an ultraviolet radiation that is retransformed, at high efficiency, into a green light—accomplished by the phosphor coating on the interior of the bulb. Other colors are possible, the announcement states, but green phosphors convert "black light" to visible light most efficiently. A tiny resistor in the lamp base stabilizes current flow after discharge begins.

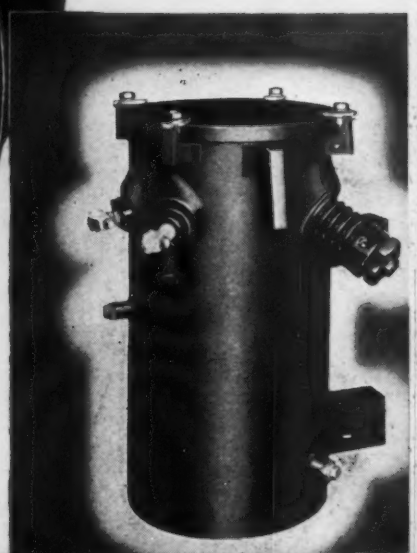
According to the manufacturers, lamps operating on this principle and in other colors and in slightly larger sizes probably will be available after the war.



Let's look again at this Kuhlman B. I. Core

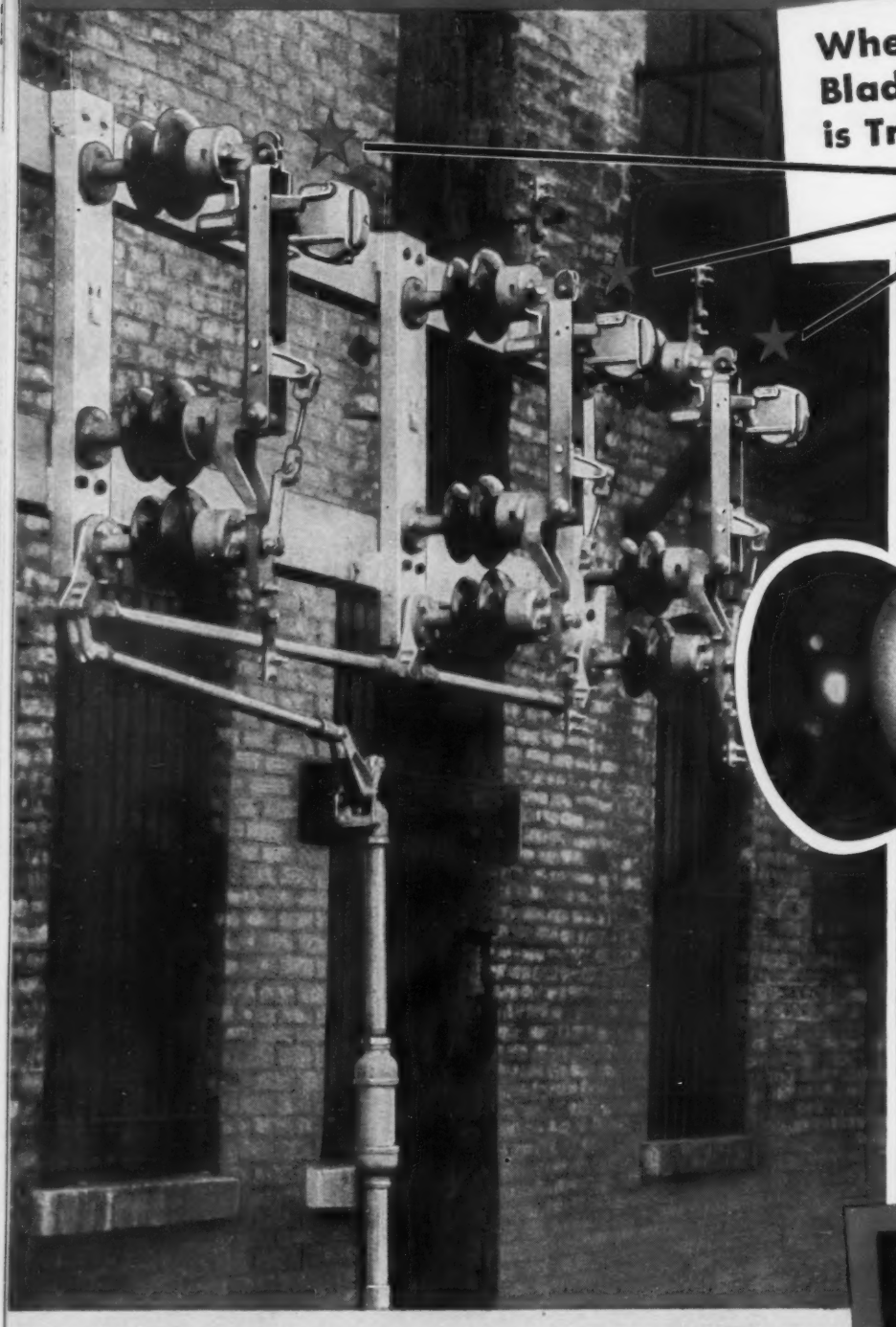
Conceived, developed, perfected and first introduced by the Kuhlman Electric Co. the Bent Iron (B.I.) Core utilizes to the fullest extent the many advantages inherent in present day materials. The result is reduced exciting current, general improvement of operating characteristics, a lighter, easier-to-handle transformer and a considerable saving of two critical metals—iron and copper. As compared with former conventional core and coil methods, the Kuhlman B. I. construction saved enough iron for the building of fifteen medium tanks and enough copper for three million .50 calibre shells in the Kuhlman plant alone, in one year. Multiply this many times and you get an idea of the metal saving in the transformer industry—metal for conversion to tanks, bullets, guns and other fighting equipment for the fighting men of the Allied Nations.

In addition to distribution transformers Kuhlman builds Power, C.S.P., Saf-T-Kuhl transformers and line regulators. If you do not now have the Kuhlman Catalogs describing these units, write for your copies today.



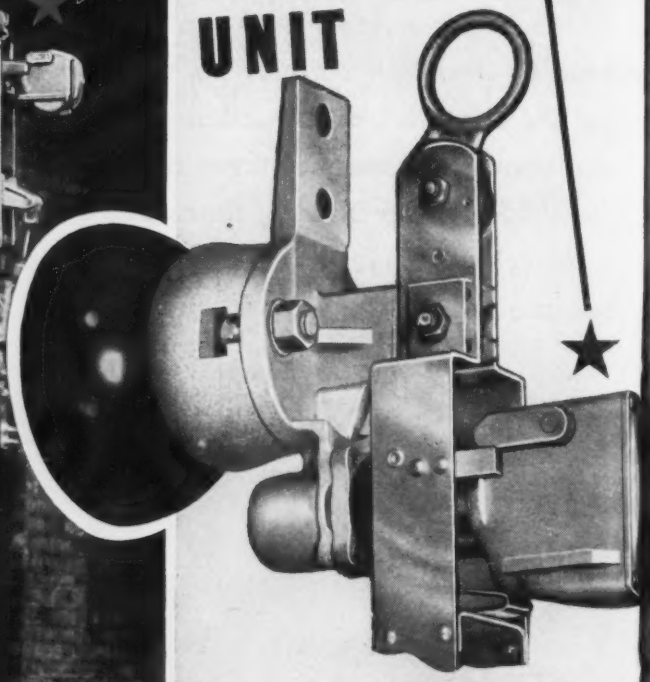
Kuhlman ELECTRIC COMPANY
BAY CITY, MICHIGAN

BREAKS LOAD SAFELY . . .



When the Main Switch Blade is opened, the current is Transferred to the

S&C LOAD INTERRUPTER UNIT

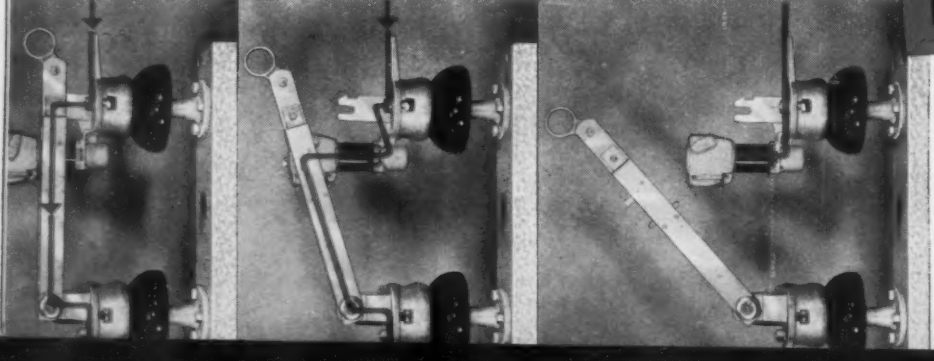


● The opening movement of the switch blade actuates the Load Interrupter Unit mechanism, which clears the circuit without external arcing . . . in a cycle or less.

1. Closed position of switch. As soon as blade is opened, current is carried through the Interrupter Unit.

2. As the blade is opened the mechanism in the Interrupter Unit is actuated to affect the separation of the Interrupter terminals at high speed.

3. By the time switch blade reaches this position, safe air gap in circuit is established, eliminating possibility of leakage current between switch terminals.



S&C LOAD INTERRUPTER DISCONNECTS

Reduce Costs . . . Speed Installation

Use Them . . .

- For sectionalizing feeder circuits
- To disconnect capacitor banks.
- To isolate transformer banks.
- To isolate Industrial Plant feeders
- To interrupt exciting current of feeder regulators.
- As throw-over switches between

AND WITHOUT ARCING
AT MAIN SWITCH CONTACTS

S & C LOAD INTERRUPTER DISCONNECTS
COST BUT LITTLE MORE THAN PLAIN DISCONNECTS

You can now interrupt load currents up to 400 amperes at 15,000 volts safely—and without arcing at the main switch contacts with S & C Load Interrupter Disconnects. And these Switches cost but little more than plain disconnects.

They meet many load switching requirements at substantial initial and maintenance savings over larger and more expensive circuit breaking equipment. Space, weight, and installation time are reduced.

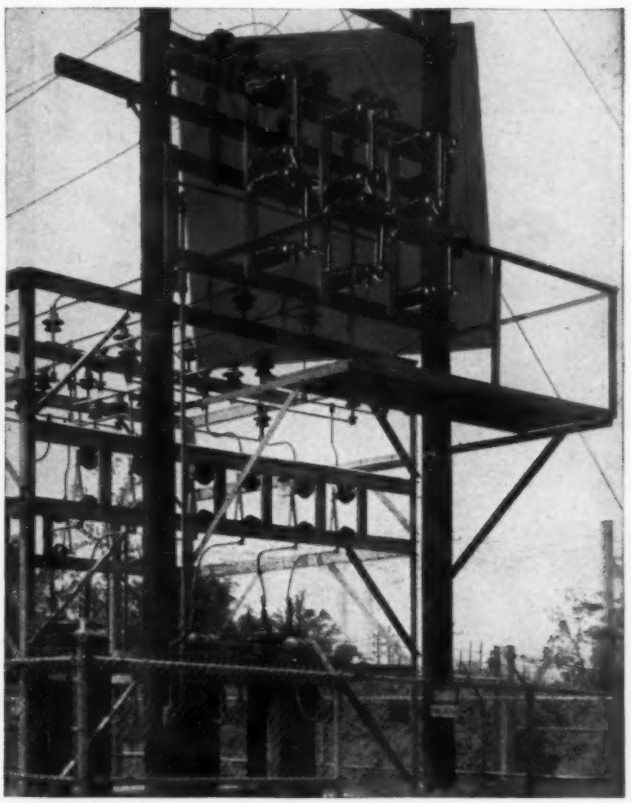
Further,—in combination with S & C Fuses, as in the substation installation shown at right, both load switching and short circuit protection are provided. No horn gap or stick-operated Switches, as required for other circuit-breaking equipment, are needed.

Widely installed over a period of several years, performance records have been established which fully justify their use.

Specific uses for the Load Interrupter Switches and for Fuse Combinations are outlined on these pages...For what uses can you adapt them?

Use
INTERRUPTER SWITCHES AND FUSE COMBINATIONS

- **For substation feeder circuits.**
- **For branch distributing feeders.**
- **For high voltage switching and short circuit protection on primaries of industrial customer substations.**



FOR *New* SUBSTATIONS LIKE THIS:

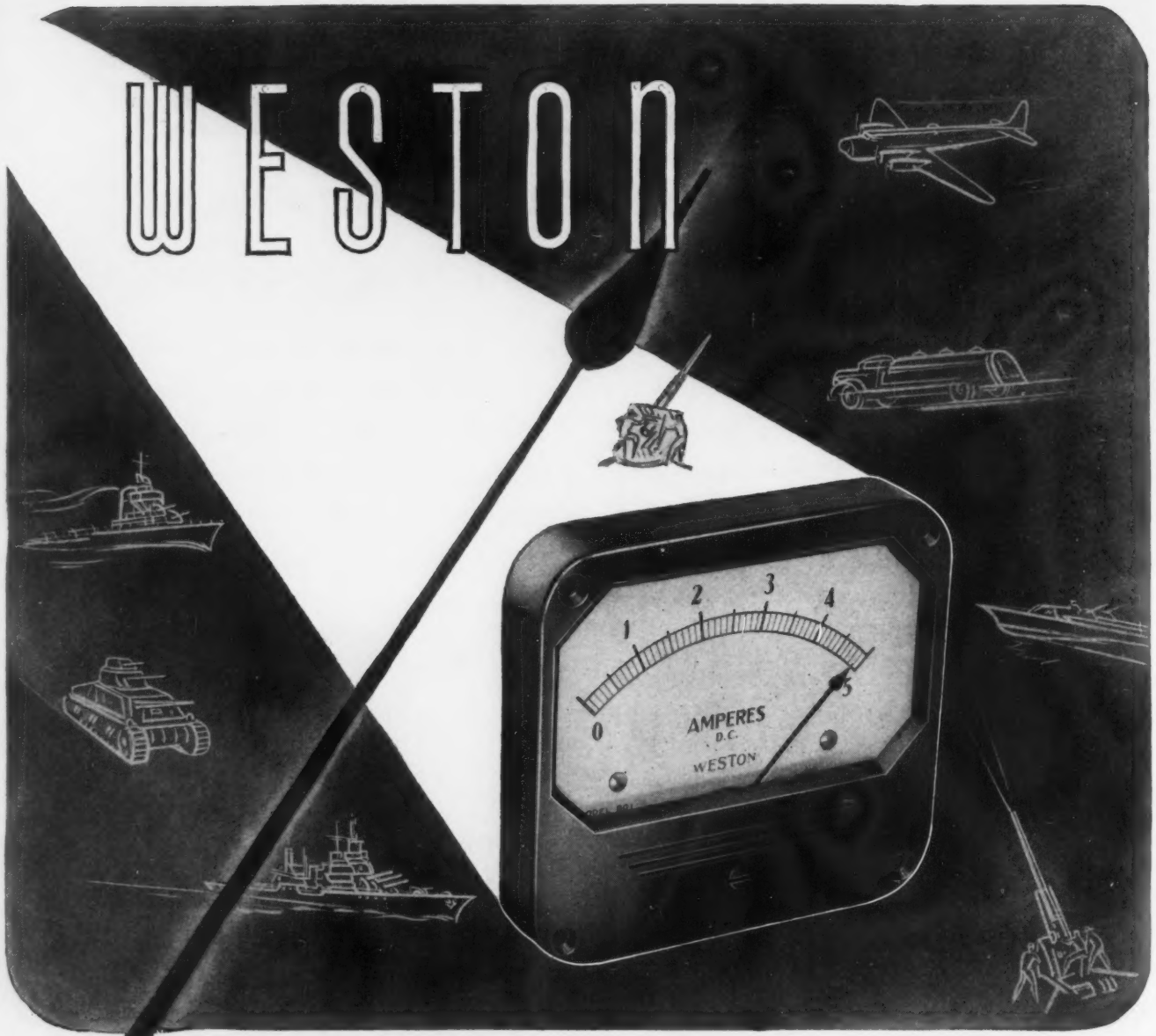
S & C Load Interrupter Disconnect and Fuse Combination on primary of three-phase stepdown transformer substation. Switch gang-operated handle located on pole near ground... The Heavy Duty Fuses have short-circuit interrupting ratings of:—20,000 r.m.s. amperes at 13,200 volts; 25,000 r.m.s. amperes at 6600 volts; 30,000 r.m.s. amperes at 2300/4000 volts.

MADE IN *BOTH* OUTDOOR AND INDOOR TYPES

WRITE FOR BULLETIN 202-A

SCHWEITZER & CONRAD, Inc.

4435 Ravenswood Avenue, Chicago 40, Illinois



CONTINUING LEADERSHIP

. . . *through the war and beyond!*

The start of the new year finds instrument headquarters still *busy at it* in the final drive for victory. Dependable WESTON instruments, in all familiar types, continue flowing in unprecedented quantities to every battle front. *In new types, too;* for all during this period of stress WESTON development laboratories also have *led the way* . . . continually meeting the new measurement problems of this mechanized war. Thus when instrument priorities are relaxed, WESTONS will continue as industry's *standards* for all measurement needs. For, *new* measurement tools as well as *old* will be available in their most *trustworthy form* . . . here at instrument headquarters. Weston Electrical Instrument Corp., 591 Frelinghuysen Ave., Newark 5, N. J.

Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transformers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters...Aircraft Instruments... Electric Tachometers...Dial Thermometers.

FOR OVER 55 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS

WESTERN REPRESENTATIVES

Seattle, Wash.	San Francisco, Calif.	Los Angeles, Calif.	Denver, Colo.	Phoenix, Ariz.
Eicher & Bratt	Herman E. Held,	Edward S. Sievers,	Howard Peterson,	J. E. Redmond Co.,
963 Colman Bldg.	420 Market St.	417 So. Hill St.	1921 Blake St.	448 W. Madison St.

HOW TO MODERNIZE YOUR STREET LIGHTING AT MINIMUM COST

Use a "Master Plan" When Ordering Renewal Parts

Do you find that the older luminaires in your street-lighting system become more difficult and expensive to maintain each year? You can replace them gradually, without wastage, by using the economical plan described in the G-E *Novalux Renewal-parts Catalog*.

By following this master plan, you can order lighting parts, for immediate use or for stock, in such a way that you can gradually retire the older types of luminaires and standardize your equipment with the modern renewals. Standardization reduces the quantity of stock parts needed and greatly simplifies ordering and obtaining them. This plan helps you to make the greatest possible savings in maintenance and in the cost of modernizing your system.

G-E Renewal-parts Service Makes It Easy to Order

You can set up an economical, permanent system for reordering by using the company-personalized Standardization Charts which we will make, on request, to illustrate the particular combinations of parts that you use. Also, G-E Renewal-parts Service includes leaflets that contain detailed data on the most commonly used G-E Novalux parts. Your G-E lighting specialist will be glad to assist you in getting all the benefits of this service.

Catalogs Still Available... Have You Sent for Yours?

This pictorially indexed catalog will identify your parts quickly. It presents the suggested master plan for the control of stock and gives other helpful information. Send for your copy of GEA-4084. *General Electric Company, Schenectady, N. Y.*

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds

GENERAL ELECTRIC

452-24-3010

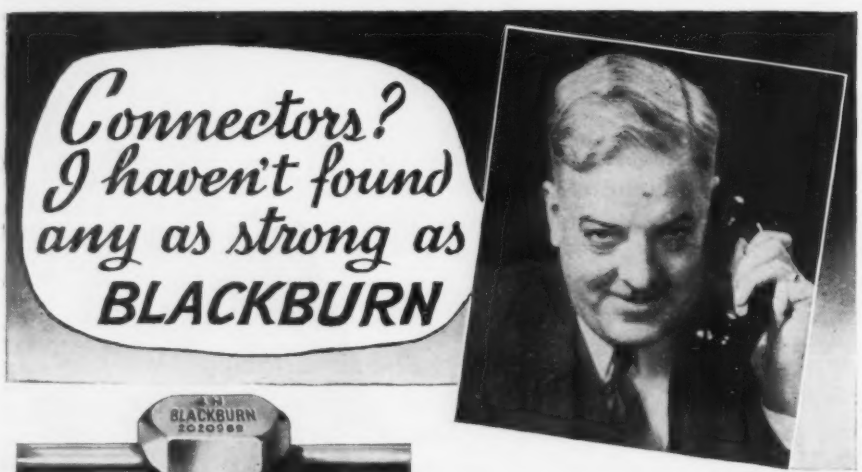
CHROMALOX
HEATFLO
THE IDEAL
REPLACEMENT UNIT

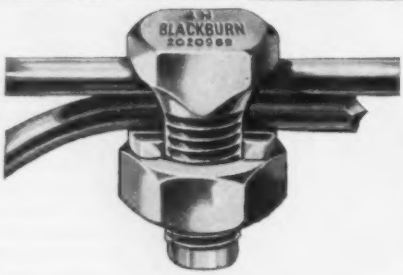
Five minutes with screw driver and pliers puts a new Heatflo unit to work. Snap-on adaptor rings fit any range, any type of opening. When a customer needs service, send a man with a Heatflo. One short call does it—brings pleasure to the customer, profit to you. Write.

Chromalox Super-Speed Range unit repair parts, also available without priority, under WPB limitation orders.

MONTGOMERY BROTHERS
911 Western Ave., Seattle 4, Wash.
2333 N. W. Westover St., Portland 10, Ore.
61 Fremont St., San Francisco 5, Calif.
420 S. San Pedro St., Los Angeles 13, Calif.
THE PETERSON CO.
1925 Blake St., Denver 2, Colo.

EDWIN L. WIEGAND CO.
7540 Thomas Boulevard
Pittsburgh 8, Penn.





Millions in use throughout the world

BLACKBURN CONNECTORS are made completely of a high-strength copper alloy, actually stronger than steel, and more durable than pure copper or commercial bronze.

Blackburn Connectors contain no lead or zinc, and will not season-crack under the most severe weathering conditions. Because of their great strength they can be used over and over again — a real economy.

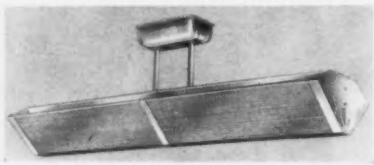
Over 75 conveniently-located Jobbers' Stocks

JASPER BLACKBURN PRODUCTS CORP.
Main and Clinton Sts., St. Louis (6), Mo.
Builders of Quality Connectors for Over 10 Years

All-Purpose F Unit (203)

Sylvania Electric Products is offering a new all-purpose fluorescent fixture which can be secured with priority rating of A-1-j or better. This fixture consists of a basic chassis with accessories to adapt it to various structural conditions. The purchaser may select an unshielded unit, or the shielded unit pictured.

Four 40-watt lamps and starters are included in the standard package. The reflector has a reflection factor of 86%. Ballasts are enclosed and knockouts are conveniently located for service entrance and pendant mounting. Operating voltages—110-220 volts, 60 cycle a-c; obtainable in 50 cycle at slightly increased cost.

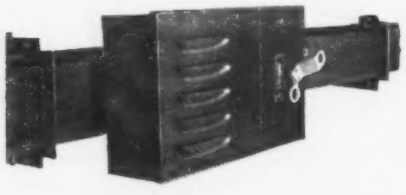


New "Warrior" Unit (204)

The new Curtis "Warrior" fluorescent unit is available for four 40-watt lamps. Louver assembly, ballast shields and reflector are of non-metallic "Fluratex" and are finished glossy white Fluracite, a baked synthetic material developed by Curtis. Individual units are available either for ceiling mounting or as pendants. They are wired with 110-120-volt, 60-cycle, high power factor, tulamp ballasts, lampholders, starter sockets and FS-4 starters. The pendant unit is 14 in. wide, 48¾ in. long; suspension ceiling to bottom of unit 41¾ in. The ceiling mounted unit is 14 in. wide; suspension ceiling to bottom of unit 8¼ in. over-all. Each additional section in a continuous line adds 48⅛ in. Shielding angle of louver is 45° crosswise and 30° lengthwise.

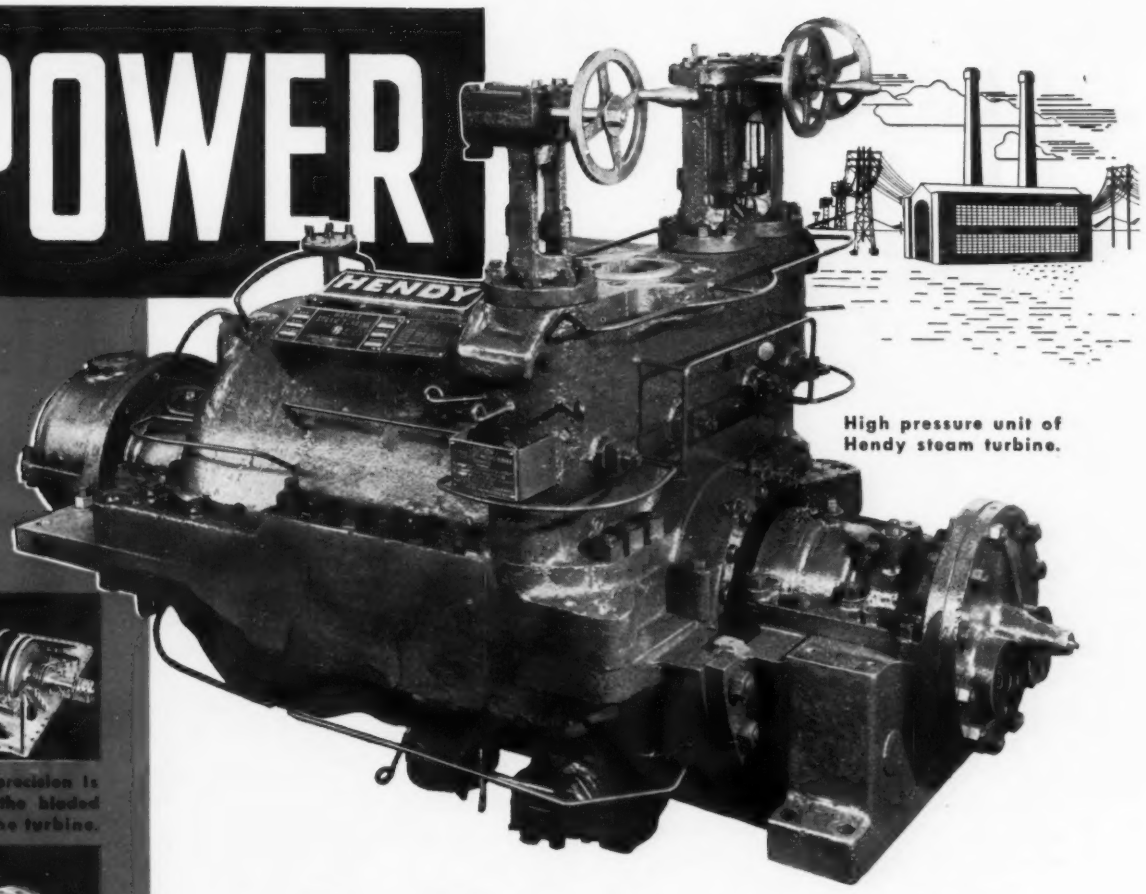
Capacitor Plugs (205)

Capacitor plugs that can be inserted into plug-in openings along a bus duct run and moved as load areas change, have been designed by BullDog Electric Products Co. The unit consists of 60-amp., three-pole fusible switches, or 15- to 50-amp. circuit breakers connected ahead of three-pole single unit capacitors having discharge resistors. These plugs are made for 230- or 460-volt, 60-cycle service in capacitor ratings of 1 to 15 kva. They have operating mechanisms of special design placed on the hinged covers over the protective devices, facilitating pull-chain operation from the floor. Louvered screw-on covers are provided over the capacitor units.

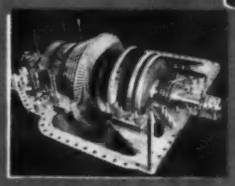


The manufacturer claims that a capacitor plug installation will improve or relieve entirely conditions resulting from an overloaded system and frequently makes possible the addition of new load without adding to bus bar sizes in use.

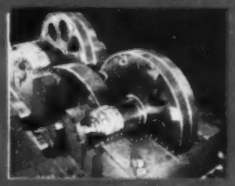
POWER



High pressure unit of Hendy steam turbine.



The utmost precision is essential in the bladed spindle of the turbine.



Hendy marine reduction gear unit for the 4,000 hp C-1 power plants.

THE BALANCE OF POWER

The assurance of long life and low maintenance for a turbine depends on how well such a power unit is balanced. One way is to build them—and then compensate for weight differences. But the correct way is to build each of the 4,000 parts so meticulously to precision dimensions in the first place that the unit doesn't have to be balanced by supplementary means. Then it will always remain in balance for there's nothing artificial about it!

For a smooth-running vibrationless unit—you can rely on the "balance of power" in a HENDY built turbine.

FOR THE SEA TODAY
...for INDUSTRY tomorrow

Challenged to put steam turbines on a mass production basis, Hendy telescoped into twenty months a decade of turbine manufacturing progress. In doing so a new chapter has been written in the history of turbine production, and as well new standards of quiet, smooth turbine performance have been created by the Hendy product.

Now entirely for marine service, the output from Hendy includes turbines for 300 kw generator sets, 4,000 hp, 6,000 hp and 8,500 hp turbines for propulsion of cargo ships—in addition to complete reduction gear units for them.

Post-war industry will find performance in Hendy turbines—will find them prime movers whose dependability has been thoroughly established in war service.

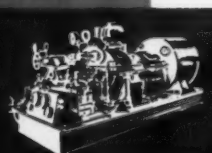
JOSHUA HENDY Division
JOSHUA HENDY IRON WORKS

ESTABLISHED 1856

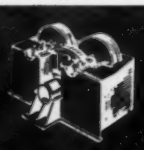
SUNNYVALE, CALIFORNIA

BRANCH OFFICES: Boston · Buffalo · Chicago · Cincinnati · Cleveland · Detroit · New York · Philadelphia · Pittsburgh · San Francisco · St. Louis · Washington · Los Angeles

HENDY



TURBO-GENERATORS



REDUCTION GEARS

STEAM TURBINES

DIESEL ENGINES

More Power to

–these J-M Electrical Materials are helping to transmit peak power loads to speed war output

ELECTRIC POWER is the very heartbeat of our war production. Hundreds of machines and materials must work together to keep that power pulsing through the nation's underground and overhead distribution networks. Not even the smallest part can be allowed to fail.

Throughout the electrical industry, Johns-Manville Electrical Materials are helping avoid waste, save fuel, cut costs. Backed by the knowledge accumulated through 86 years of experience, these products are playing a war role today and, in most cases, are also available for construction and maintenance requirements.

The complete line of Johns-Manville Electrical Materials is described in Catalog GI-6A. Send for your copy today. Write to Johns-Manville, 22 East 40th Street, New York 16, New York.

OTHER JOHNS-MANVILLE PRODUCTS FOR THE ELECTRICAL INDUSTRY

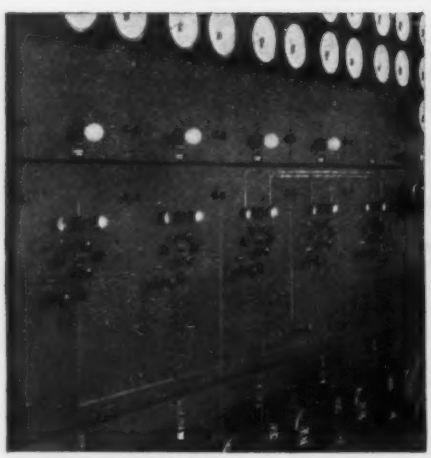
ELECTRICAL MATERIALS NOT ILLUSTRATED:

Chemstone
Electrobestos
Asbestos Tapes
Friction Tapes
Splicing Compounds
Asbestos Transite

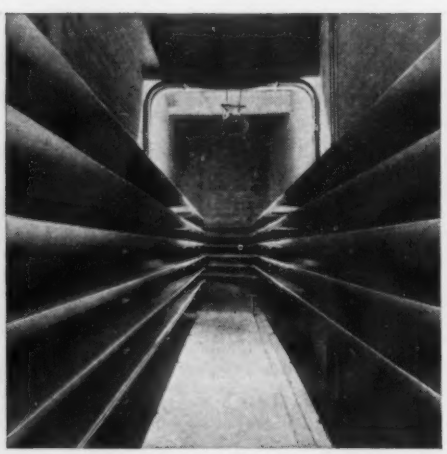
ALSO

High Temperature Insulation
Refractories
Transite Partitions
Acoustical Materials
Packings
Built-Up Roofing
Industrial Flooring
Transite Pressure Pipe

JOHNS-MANVILLE ELECTRICAL MATERIALS



ASBESTOS EBONY, now again available, is a permanent, light-weight mineral product. It won't rust, rot, shrink, crack or buckle. Impervious to water, gas, oil and ordinary chemicals. Has high dielectric strength and insulation resistance.



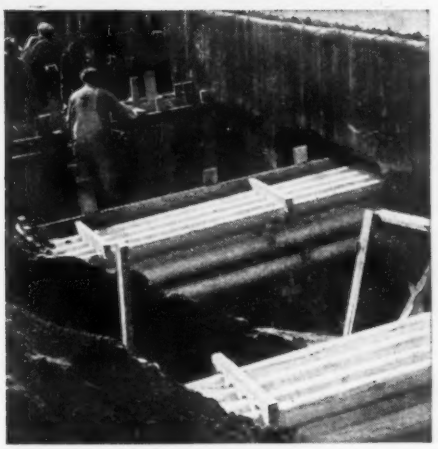
TRANSITE CABLE TRAYS are made of an incombustible, strong, corrosion-resistant material. Designed to support control cables and low-capacity power cables, Transite Cable Trays save space, cost less to install, need no maintenance.

CABLE FIREPROOFING. Niagrite-Asbestoment, consisting of Niagrite, a commercially pure asbestos tape with or without reinforcement, and an efficient refractory, Asbestoment, provides fireproof protection for cables.

War Industry!

TRANSITE CONDUIT. Made of asbestos fiber and cement, Transite Conduit is approved for use underground without concrete envelope. Both Transite Conduit and Korduct help provide lower installation cost and reduced maintenance expense.

SEALING COMPOUNDS. J-M makes several sealing compounds—Duxseal, Pakseal, Tranolseal and Nodrseal—each one with certain characteristics. All are easily workable at 35° F., with no slump at 300° F. They won't harden materially when exposed to air.



TRANSITE KORDUCT. Korduct is identical with the Conduit except for its lesser wall thickness. Like Transite Conduit, Korduct is fireproof and highly resistant to internal or external corrosion, electrolysis and action of soil chemicals.

★ ★ ★ WATER ON DECK *REQUIRES* MOTOR CONTROLS ★ ★ ★

So important are the requirements for fluids aboard ship that only the most dependable controls are used in the regulating and pumping systems.

Ward Leonard motor starters are furnished in great numbers for use on war craft and merchantmen. They are Ward Leonard designs that meet navy requirements.

Users of motor starters for marine and other purposes will find in the Ward Leonard Line exactly the equipment to best do the required job. The dependability that is the first consideration for nautical use is desirable in all other types of endeavor.

Send for data sheets and bulletins describing Ward Leonard Motor Starters and other control devices.

ARMY E NAVY ARMY E NAVY

WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control (WL) *devices since 1892.*

WARD LEONARD ELECTRIC CO., 68 South St., Mt. Vernon, New York

Circular F Lamp (206)

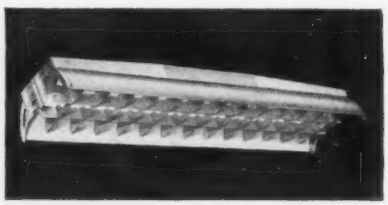
General Electric and Westinghouse have announced that as soon as possible after the war a circular fluorescent lamp will be added to the Mazda line. Sizes to be produced and current consumption are:

Approximate Over-all Outside Diameter of Circle	Maximum Bulb Size	Approximate Watts
8½ in.	T-10	20
12¼ in.	T-10	30
16 in.	T-10 or T-12	40

Egg-crate Luminaire (207)

Edwin F. Guth Co. is offering a new egg-crate-louvred luminaire which conforms to WPB metal limitations and which the manufacturer recommends for high intensity and comfortable quality in offices and drafting rooms.

Called the Futurliter, the unit is designed for close ceiling or ceiling suspension and

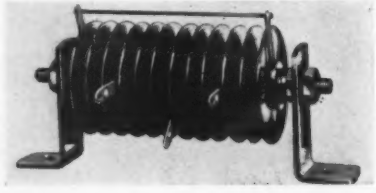


can be mounted singly or end-to-end in continuous runs for 50- to 75-f-c installations. Each 48-in. unit can be furnished for use either with two or three 40-watt lamps. Available with conventional ballasts, with starter switches or with the new Quick-Liter ballast which uses no starter switches.

A feature of the open-type construction is lower maintenance cost of the unit resulting from the fact that insects and dirt are not trapped behind the glass.

Power Rectifiers (208)

Selenium Corp. of America has announced the Selco line of power rectifiers, with seven disc sizes ranging from ¾ to 4½ in. diameter available. These units are said to be moisture proof and to have permanent characteristics. Assemblies with output up to 1,000 amp. can be supplied. Rectifiers are of the selenium type.



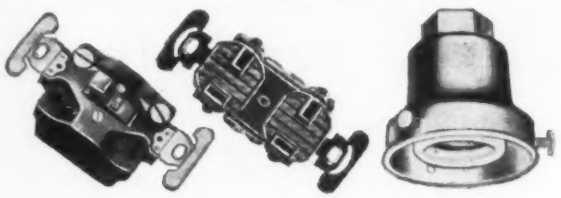
Unit for Aircraft (209)

A rectifier designed to operate modern, heavy-duty aircraft gun turrets has been announced by Airplane Mfg. & Supply Corp. According to the announcement, the heavy inrush current required can be delivered while ample voltage is maintained to prevent drop-out of turret relays. The no-load voltage is said to be within the safe limit of any delicate electronic device or other electrical equipment in a plane.

MONCOR SURFACE WIRING DEVICES

For Factories, Farm Buildings, War Housing, Military Structures, etc.

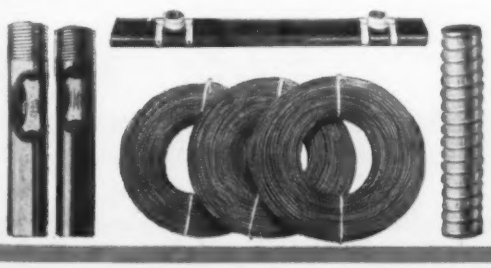
INDUSTRIAL WIRING DEVICES



There are G-E wiring devices for every sort of war-project wiring need—for maintenance, rewiring or new wiring. These devices include switches, outlets, twist-lock devices, sockets, connectors, connector bodies, caps, fuses, fluorescent lampholders and starters, etc. All of them are high quality.

G-E CONDUITS AND BUILDING WIRES

There are G-E conduits and building wires for every purpose: White and Black rigid conduits, EMT, flexible conduit, Fiberduct and various building wires including moisture-resistant wire and Type SN small diameter thermo-plastic insulated wire.



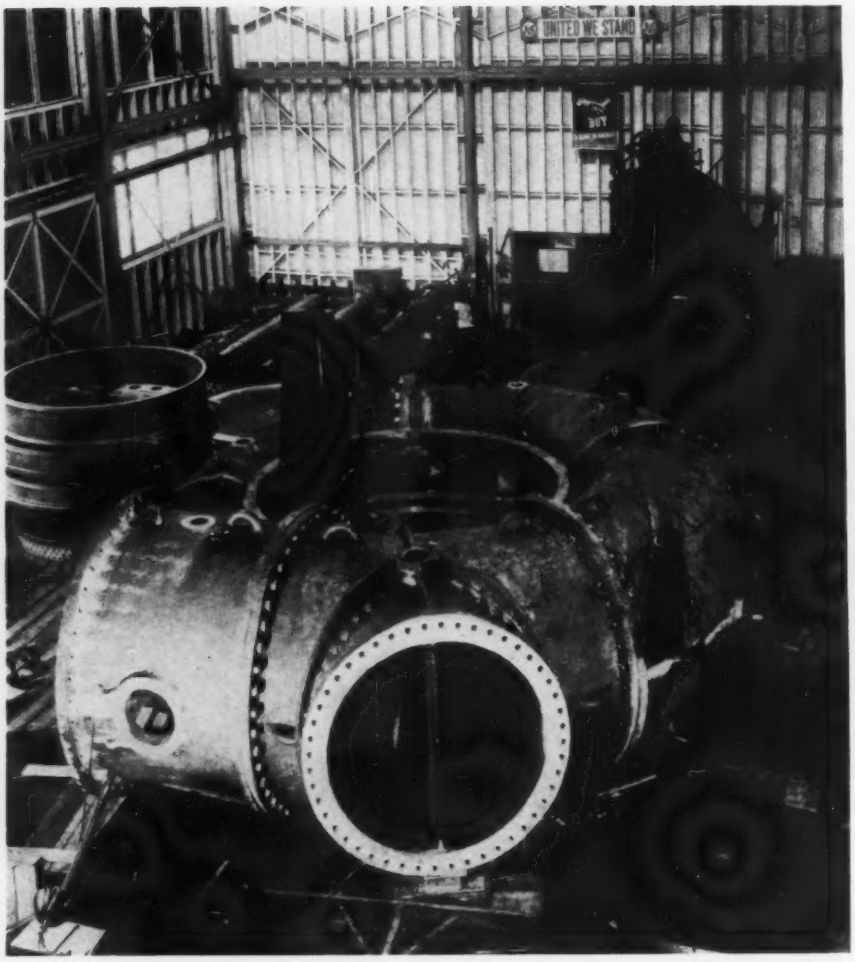
HERE are surface wiring devices you'll be proud to install. They are made of good looking, sturdy brown Textolite and provide a neat finished appearance to surface wiring systems.

Moncor Surface Wiring Devices are ideal for installation in military structures of all kinds, factories, farm buildings, war housing, garages, etc. The requirements of every surface wiring job, whether cables are exposed or hidden, are met by these devices. They are approved by the Underwriters' and they meet requirements of the specifications of different government agencies.

These devices can be installed quickly too, using either BraidX or BX. Knockouts in ends, sides and backs of the devices enable them to be end connected, side connected (knob and tube or cleat wiring) or back connected for concealed wiring.

FOR FURTHER INFORMATION about Moncor Surface Wiring Devices, G-E industrial wiring devices, wires and cables and conduits, see the nearest G-E Merchandise Distributor or write to Section CDW-243-18, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC



There Is No Shortage of War Bonds!

Another PELTON TURBINE *for Reliable*

Power *in War and in Peace*

55,000 H.P. Unit Recently Installed in Pacific Northwest

When installed in Washington, this scroll casing for a 55,000 H.P. Pelton Turbine receives and directs the water through blades to the turbine runner which spins in the center.

Assembled and machine-finished in the Pelton shops, the scroll casing alone represents 176,500 pounds of cast steel, while the interior diameter is 132 inches. The turbine shaft, not shown, is directly connected to the generator.

When peace comes, this reliable prime mover will continue its efficient service, for Pelton Turbines last a long age with little upkeep.

For 63 years Pelton has pioneered and consistently improved hydraulic turbines and their control equipment. Many of the largest power projects have relied upon Pelton Turbines all through these years.

THE PELTON WATER WHEEL COMPANY

Hydraulic Engineers

2929 NINETEENTH ST., SAN FRANCISCO, 10

EXCLUSIVE WESTERN REPRESENTATIVES for Baldwin-Southwark Division of Baldwin Locomotive Works, Baldwin-De La Vergne Sales Corp., Woodward Governor Co. and Cone Valve Division, Chapman Valve Mfg. Co.

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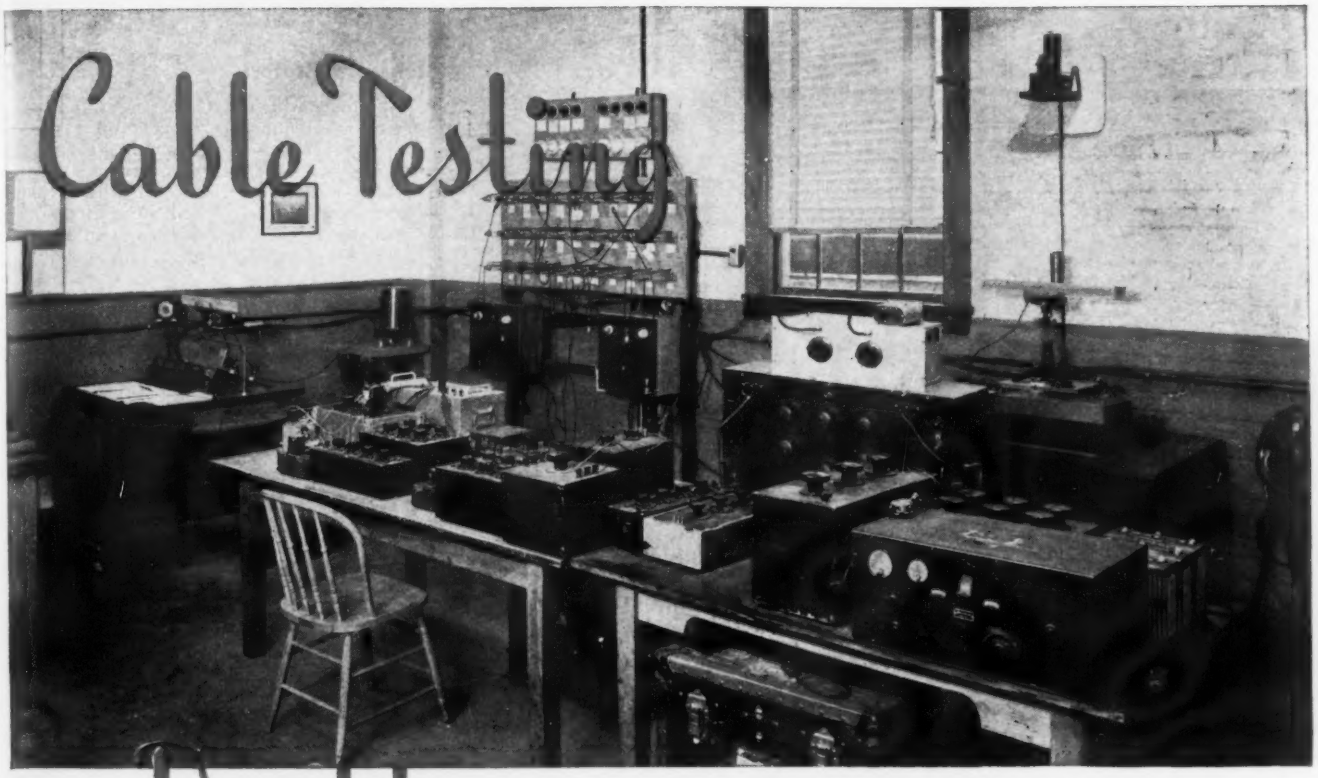
THE BALDWIN GROUP

PELTON

Subsidiary of THE BALDWIN LOCOMOTIVE WORKS



IS Doubly IMPORTANT NOW . . . . .

The excellence that has for many years distinguished Simplex insulated wires and cables has not been accidental. It was the natural result of careful supervision of materials and processes supplemented by both routine and special electrical tests during manufacture. Electrical tests are doubly important now because of restrictions limiting the use of scarce, critical materials.

If you are engaged in essential war work and need cables engineered to fit your operating conditions, it will be worth while for you to learn what Simplex controlled quality may mean for you.

Simplex insulated wires and cables conform to government specifications and regulations but to maintain Simplex quality while meeting these unusual war-time limitations we have at times found it necessary to assemble special testing equipment for unusual, out of the ordinary, tests. The results have more than justified the extra work. Simplex quality is being maintained.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

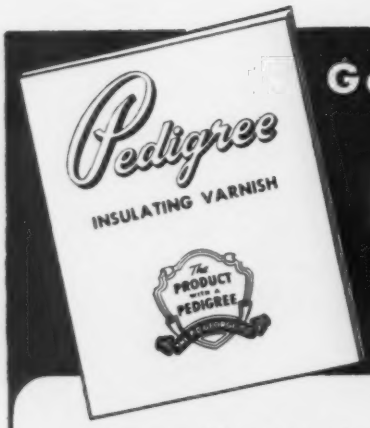
Simplex WIRES and CABLES

PACIFIC COAST OFFICES

390 Fourth St., San Francisco, Calif.

910 East Third St., Los Angeles, Calif.

503 Polson Bldg., Seattle, Wash.



Get This FREE BOOK of Facts About

PEDIGREE INSULATING VARNISHES

Here is a 40-page book of facts boiled down to essentials that is a help to any man who is interested in electrical insulating varnishes.

It shows you the different kinds of varnishes and why they are made. It gives you help on how to select the right varnish for your job, how to apply it properly, and the correct method of drying.

Many data are supplied in easy-to-understand tabular form. You will find it filled with useful information.

Write for your free copy today!

The PRODUCT with a PEDIGREE

The P. D. GEORGE CO.

5200 North Second Street • St. Louis, Missouri

Call In the Pedigree Varnish Man Nearest You.

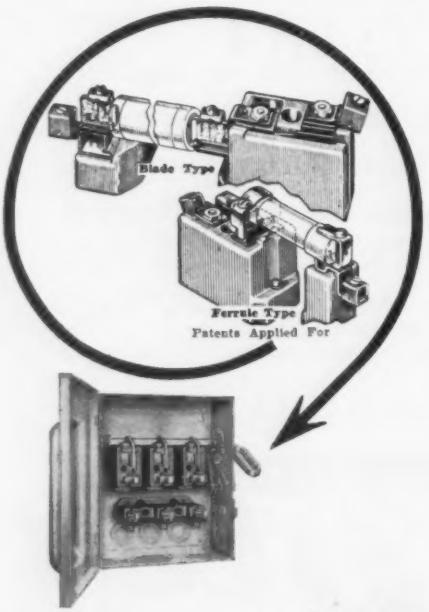
FUSES TOO HOT?

Maybe it's from poor contact between fuse and clips.

STOP IT—USE WADSWORTH

Safety Switches with

FUZE-TALONS



Fuze-Talons: The Wadsworth new development illustrated are designed on the "High Pressure Line Contact" principle. They Hold Tight and conquer vibration.

Standard on Wadsworth Type 'A' and Type 'C' Safety Switches 60 amperes and up.

Sold through Leading Electrical Wholesalers.

The WADSWORTH ELECTRIC MFG. CO. INC.

Covington, Kentucky

C. C. Hillis Co. San Francisco, Calif.

Rutkin Elec'l Sales Co. Los Angeles, Calif.

W. M. Sanderlin Co. Seattle, Wash.

Enclosed Motor (210)

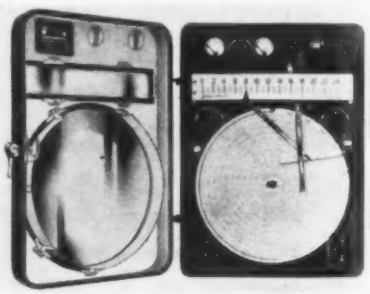
A motor, which it claims is suitable for operation in atmospheres containing injurious dusts, corrosive vapors or gasses and excessive moisture, has been designed by the Crooker-Wheeler division of the Joshua Hendy Iron Works. Called the Sealedpower, the motor is available in sizes from 1 to 15 hp. and for operation from any polyphase

power supply. It is of the totally enclosed, fan-cooled type but, according to the manufacturer, the design differs from previous models in that there are no cooling ducts to become fouled with wet or sticky dusts. All exposed parts are acid and alkaline resistant to a high degree, it is stated.

Potentiometer (211)

Bristol Co. has redesigned its Pyromaster self-balancing potentiometer. The new model has a universal wall or flush mounting case which is deeper than the previous model and has an internal hinged panel on which are mounted pen and indicator drive mechanism and, in the case of electric controllers, the control contacts or proportioning slide wire or, in the case of air control, the complete new convertible type air operated control mechanism.

On the indicating-recording model, the indicating scale is a horizontal wide band, re-

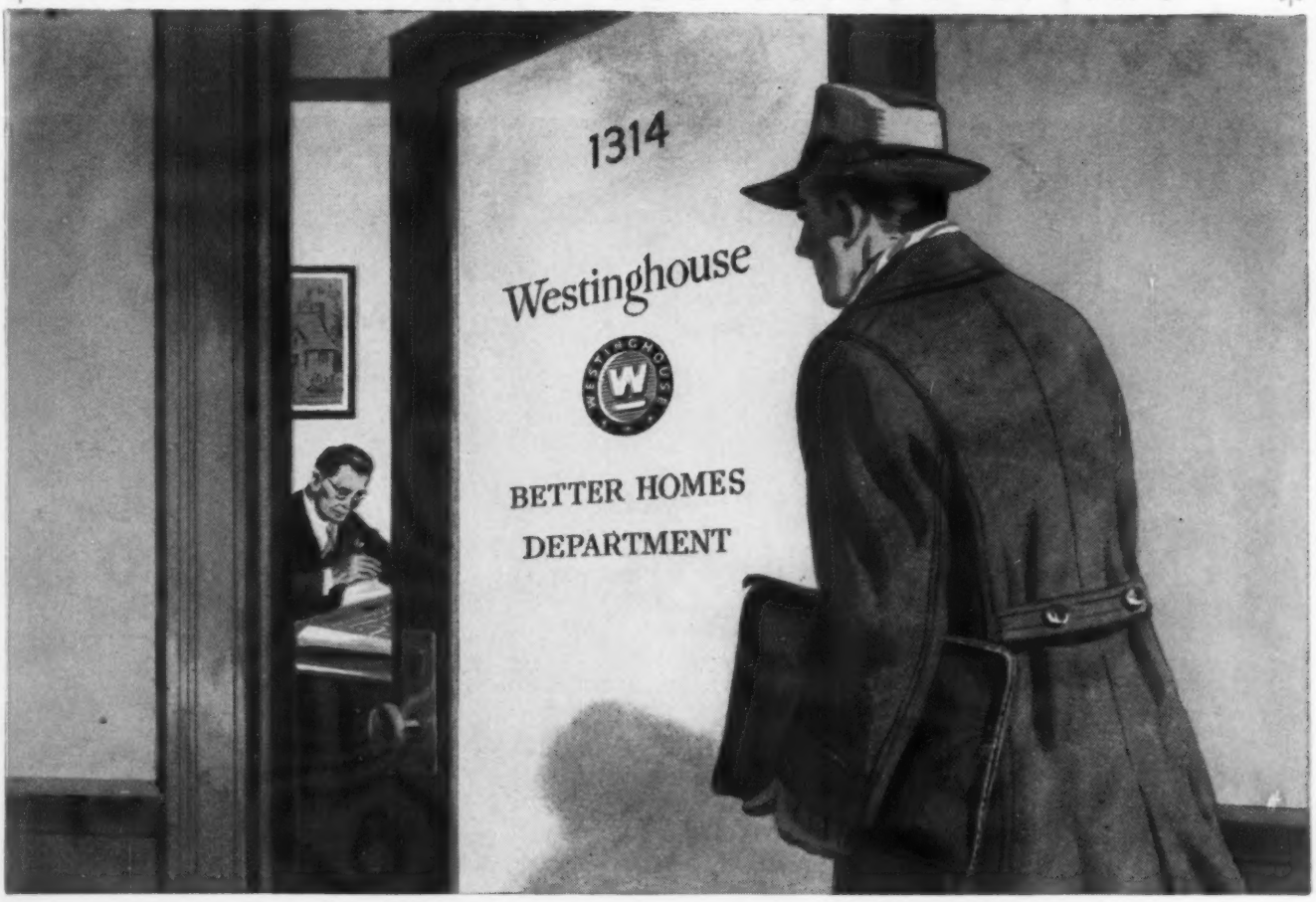


placing the former rectangular dial type band. A dust-proof bakelite housing encloses the stepping relays and the slide wire in the potentiometer circuit. A heavier power supply has been provided. A standard cell type of manual standardizing circuit replaces the voltmeter type originally supplied.

Production Plugs (212)

Communication Measurements Laboratory has developed production plugs for use with the Rotobridge in testing electronic equipment. These plugs are 5 in. long and 1¼ in. in diameter, have a steel barrel and a wooden handle. Pins are of case hardened steel. In the octal and loktal plugs, center key extends through in form of a threaded rod to permit cable to be fastened firmly in position without strain on pin connections. In addition to octal and loktal types, these plugs are available in 4-, 5-, 6- and 7-pin models, small and medium.

* BETTER WIRING FOR BETTER LIVING *



This door is always open . . .

YES, the door to the Westinghouse Better Homes Department is *always open* to assist the building profession in the planning of postwar housing.

The Better Homes Advisory Staff is ready and eager to give authoritative technical advice on the *proper applications of electricity* in 194X homes.

SIX-POINT ADVISORY SERVICE

The Better Homes Department offers a *Six-Point Advisory Service* on the following subjects:

1. Selection of correct types of electrical equipment for various classes of postwar homes.
2. Location and arrangement of fixed equipment, for conserving space and attaining maximum efficiency in arrangement of work cycles.
3. Accurate dimensions and clearances of equipment to insure proper installation and efficient operation.
4. Access for servicing of equipment—so necessary for periodic inspection and repair.
5. Location of lighting outlets and controls, for greater enjoyment, comfort, and safety in the home.
6. Utility service connections—including location and size of electric wiring, water supply, and drainage.

Westinghouse Better Homes Department welcomes the opportunity of giving constructive assistance to those interested in postwar housing.

If you have any problems relating to the selection, installation, and use of home electrical equipment, write: Better Homes Department, Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pennsylvania.

"ELECTRICAL LIVING IN 194X"

The Better Homes Department is preparing a new and unusual book—"Electrical Living in 194X" — which explains the urgent need for *better wiring for better living* in postwar homes.

This new book will be very helpful to the building profession and allied interests . . . in explaining to prospective home owners the importance of better wiring in their 194X homes.

"Electrical Living in 194X" will be made available to public utilities, architects, engineers, contractors, builders, housing authorities, electrical inspectors, building management, and investment institutions.

Watch for further announcements regarding this colorful, easy-to-understand, 64 page book!

Tune in John Charles Thomas,
NBC, Sundays, 2:30 p.m., E.W.T.

Westinghouse
Plants in 25 Cities · Offices Everywhere

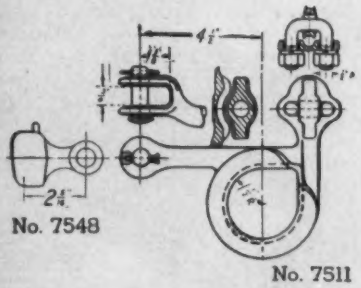
BUILDING A

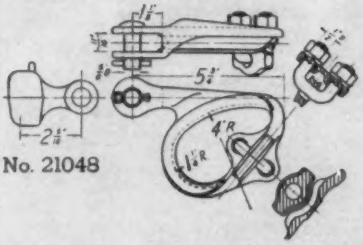
BTC

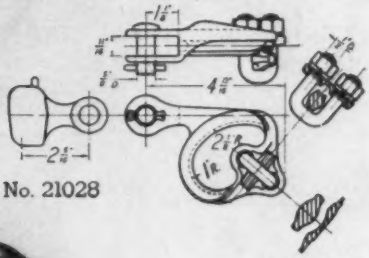
The use of forged steel results in light weight with more than adequate strength. Low in price, this hardware is especially adapted to rural electrification.

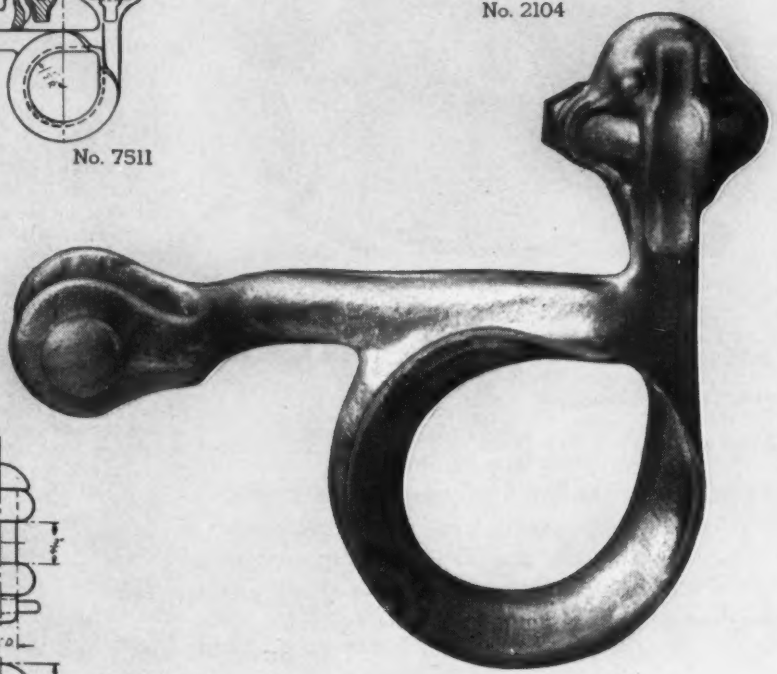
THE BREWER-TITCHENER CORPORATION

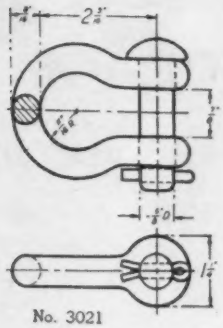
RURAL LINE?

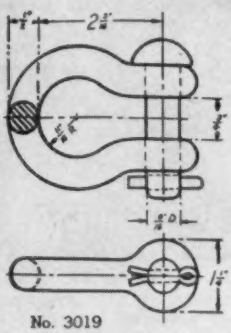


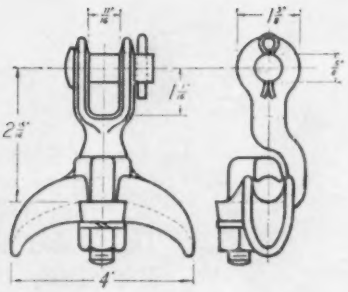


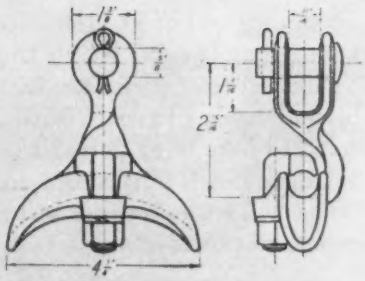


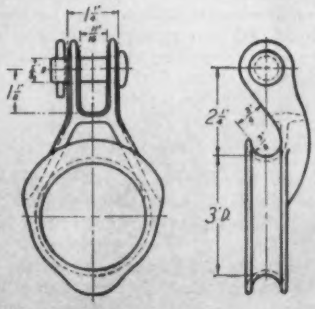










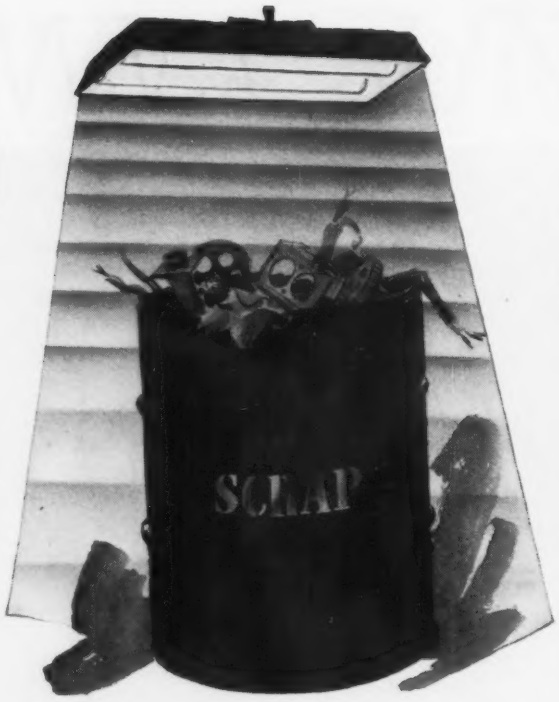


DROP FORGED HI-LINE HARDWARE

Through Your Insulator Manufacturer Only

BTC

CORTLAND, NEW YORK



CAUSE

EFFECT

REDUCE SPOILAGE with G-E *Watch Dog* STARTERS

REG. U.S. PAT. OFF.

Is spoilage in your plant becoming a problem? Then check the condition of your lighting system. Blinking and flickering of dying fluorescent lamps irritate war workers and impair the quality of their workmanship. Today that's serious! Eliminate annoying blink once and for all by switching to General Electric's new line of Watch Dog Fluorescent Starters.

THE WATCH DOG STOPS 'EM COLD

When a lamp reaches the end of its useful life, blinking and flickering start but the Watch Dog stops 'em cold. This manual reset starter cuts itself out of the circuit by eliminating all flow of current. Dead lamps are prevented from being started needlessly, current is saved, ballast is safeguarded and starter life is prolonged. All this adds up to less maintenance time when manpower is at a premium.

FS-100 for 100-watt lamps

FS-40 for 40-watt lamps

SEND FOR FREE CATALOG

The G-E Fluorescent Accessories Catalog tells how to use fluorescent accessories for best lighting results. Send your request to Section G-242-18, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

BUY WAR BONDS ★

GENERAL ELECTRIC

Carbon Brushes (213)

National Carbon Co. has developed a new series of carbon brush grades for aircraft electrical equipment. It is claimed that these brushes operate satisfactorily both at high altitudes and at sea level and under conditions of high humidity. According to the manufacturer, this series is the result of a two-year research and affords a range of operating characteristics sufficiently broad to cover practically every type of rotating electrical equipment used on aircraft.

These new brush grades are said to have in their composition accurately determined amounts of special materials which maintain a protective film on commutators and assure satisfactory brush life under all service conditions. Laboratory tests show that these new ingredients are capable of maintaining a protective surface film on commutators and slip rings in dry nitrogen and at atmospheric pressure as low as two millimeters of mercury, it is stated.

Voltage Selector (214)

A magnetic voltage selector is being manufactured by Zenith Electric Co., which states that the new unit was developed for a new electro-plating process for anodizing aluminum on a-c but has many other uses where like applications of current are required. The selector is for transferring in steps from 2 to 40 volts. The arrangement is such that, when transferring, the main contact opens before the secondary contact opens and closes after the secondary contact is closed, thus eliminating arcing. The unit embodies automatic main magnetic contacts and automatic main switch contacts for nine positions at 2½-volt intervals, from 2 to 40 volts.

Fan (215)

Chelsea Fan & Blower Co. is marketing a fan which delivers a large volume of air in a straight line to any desired spot. The discharge is said to expand only slightly and to continue as a high velocity air stream over larger distances than the ordinary fan. This unit consists of a heavy-gage welded steel housing, mounted on an adjustable pedestal, which may be tilted 60° up or down. It is driven by a direct-connected ball-bearing motor. The fan blade is of heavy steel. Available in three sizes—18 in., ¾ hp. 6,000 cfm. motor; 24 in. 1½ hp. 9,000 cfm. motor; 30 in. 1½ hp., 11,000 cfm. motor.

Hose Clamp (216)

B. F. Goodrich Co., Industrial Products Sales division, has been granted national distribution rights to the Punch-Lok hose clamp and method of applying it to hose, electric cable and wire or textile rope, it has been announced. This clamp is a mechanical device for connecting fittings, special nipples, menders or ordinary pipe to a hose. It is claimed that the connection is as strong or stronger than the hose itself and that, once the clamp has been locked, vibration or rough handling will not loosen it.

Precision Instruments (217)

The Emeloid Co. is making precision instruments from a material which it claims contains no critical metals or materials. Instruments include slide rules as well as artillery and navigation charting and calculating instruments.

It goes without saying that our Number One job is to win the war. But future-minded executives and engineers in the telephone and telegraph companies, in the electric light and power companies, and in the railroads, realize that there is no priority on careful planning. In the midst of today's exacting demands, plans are accumulating for necessary replacements, improvements, and extensions as soon as conditions permit.

In your evaluation of materials, plan to get the performance qualities that only Copperweld can give you—the *combination* of the best characteristics of both steel and copper. In steel you get strength. In copper you get high electrical conductivity and rust resistance. In Copperweld you get the best characteristics of both metals permanently molten-welded for top performance.

Our representatives throughout the country are at your service. Call upon them when you are making your plans.

COPPERWELD STEEL COMPANY · GLASSPORT, PA.

IT'S THE *PORCELAIN* THAT INSULATES

PROVING GROUND FOR INSULATORS . .

The temperament of the Lapp organization is that of dissatisfaction with existing methods, existing designs. It is this spirit which produced the Line Post and which made necessary the Lapp laboratory, a corner of which is photographed above. No sanctum sanctorum, this laboratory is truly an engineers' workshop, in continuous day-to-day use, testing, discarding, proving new designs. As we learn how to build better insulators, we build them. Meanwhile, we feel secure in our claim that today's Lapp insulators are adequately suited to today's needs, that you can do no better than to insulate your lines with Lapp. Lapp Insulator Co., Inc., Le Roy, N. Y.

ARMY E NAVY

Lapp

Better Porcelain • Better Insulators

We must win this war—first. And we must also realistically prepare for the Peace to follow. We're fighting today for our futures in tomorrow—but tomorrow will not take care of itself. Carefully detailed down-to-earth plans, therefore, must be completed—well in advance. To avoid delay in converting post-war electrical power plans into actual projects our planning must be scheduled on the basis of your anticipated requirements for Hubbard Pole Line Hardware. We've greatly expanded our production facilities to promptly serve your heavy post-war needs. Now as in the past, Hubbard sales engineers stand ready to assist you with your plans and contemplated projects.

HUBBARD
POLELINE HARDWARE

- STANDARD POLE-LINE HARDWARE
- COMMUNICATION SYSTEM HARDWARE
- ELECTRIC RAILWAY HARDWARE
- INSULATOR PINS
- POLE TOP FIXTURES AND STEEL CROSS ARMS
- STRAIN INSULATORS AND CLEVISES
- HIGH TENSION MATERIAL
- SECONDARY RACKS AND ACCESSORIES
- POLE AND CROSS ARM BRACKETS
- STREET LIGHTING EQUIPMENT
- RURAL ELECTRIFICATION MATERIAL

A SECOND STAR HAS BEEN ADDED TO OUR ORIGINAL ARMY-NAVY "E" AWARD

HUBBARD

Hubbard and COMPANY

OAKLAND, CAL. PITTSBURGH CHICAGO

HUBBARD

HANG THE LOAD ON HUBBARD HARDWARE

Now YOU CAN ORDER

5905 Page 6
May 3, 1943

UNIT SUBSTATIONS

REPETITIVE-MANUFACTURE

MASTER UNIT SUBSTATIONS

13.2 Kv–66 Kv Primary Voltages
4.33 Kv or 2.5 Kv Secondary Voltages
BASIC SPECIFICATIONS FOR UNIT ARRANGED AS IN FIG. 10

Unit Substation Rating

The outdoor unit substation will have the following rating in accordance with the Standards of the American Institute of Electrical Engineers:

Capacity ..... ("t") Kva
Frequency ..... 60 cycles
Phases ..... Three
One incoming three wire 13.2-66 Kv circuit
Two outgoing three wire 2500 volt or four wire 4330 volt circuits.

The Outdoor Unit Substation Will Consist of the Following Co-ordinated Parts:

Transformer Section with

Three-phase transformer oil-filled rated ("t") kva, self-cooled (55 C rise), 60 cycles with ( ) kv high voltage and 2500-volt delta or 4330-volt grounded wye low voltage.

The transformer section shall be provided with:

Cover bushings
Three-element winding temperature equipment
Standard accessories
Sealed tank construction
1500 kva and below at voltages 34.5 kva and below. Gas-oil seal all other ratings.
Two 5% *rated kva taps below normal rated high voltage with externally operated manual tap changer

All details will be in accordance with the applicable sections of the Proposed Standards of the ASA, dated March 1940.

If specified, automatic tap-changing equipment will be furnished which will operate under load to give approximately 15/16% taps above rated secondary voltage; and 8 approximately 15/16% taps below rated secondary volts at a current equal to the transformer current at rated kva and rated secondary volts. This equipment will include a contact-making voltmeter, line-drop compensator, necessary auxiliary control mounted in a weatherproof steel compartment.

The transformer section low-voltage bushings and metal throat will be properly co-ordinated to bolt together with the feeder switchgear section in the field.

Feeder Switchgear Section with One Auxiliary Compartment containing:

1—Hinged steel panel.
1—Relay, auxiliary, with automatic-reset contacts, and hand-reset target, connected to the transformer-temperature relay for tripping the transformer-secondary circuit breaker in case of excessive transformer winding temperature.
1—Watthour meter with indicating demand register.
1—Voltmeter and transfer switch.
3—Potential transformers, 2400/120-volt, 200 kva with fuses of the current-limiting type.
1—Control-power transformer for closing circuit breakers, oil-cooled, single-phase, 5 kva, 2.5 kv, 220/110 v with fuse of the current-limiting type.
1—Storage battery for breaker tripping 24-v sealed-in-glass jar type, consisting of two six-cell units having a suitable discharge rate to a final voltage of 1.57-v per cell.
1—Copper oxide battery charger with ammeter, cut-off switch, and variable resistor.

One Transformer Secondary Breaker Compartment with

1—Power circuit breaker, vertical lift type, TPST, ("q") amp, ("p") kva interrupting capacity, 220-v, a-c rectifier solenoid-operated with 24-v, d-c potential trip coil, necessary auxiliary switches, latch-checking switch and control relay.
1—Hinged steel panel.
3—Relays, overcurrent induction type with inverse-time characteristics for back-up short-circuit protection. Operation of these relays will trip all power circuit breakers in the unit substation.
1—Circuit breaker control switch, with red and green indicating lamps and maintaining contacts.
1—Relay, reverse power, for tripping the transformer breaker on reverse power faults.
3—Relays, overcurrent, induction to provide the above reverse power relay with overcurrent time-delay characteristics.
1—Reclosing relay, for reclosing the transformer secondary breaker upon the restoration of normal three-phase voltage of proper phase rotation at the power transformer secondary.
1—Control-power transformer for closing circuit breakers, oil-cooled, single-phase, 10 kva, 2.5 kv, 220/110 v with fuse of the current-limiting type.
1—Control-power switch.
3—Current transformers.
2—Potential transformers, 2400/120 volts, 200-volt-amperes, with fuses.

Two Feeder Breaker Compartments **each** with

1—Power circuit breaker, vertical lift type, TPST, ("s") amp, ("t") kva interrupting capacity, 220-v, a-c rectifier solenoid-operated with 24-v d-c potential trip coil, necessary auxiliary switches, latch-checking switch, and control relay.
3—Current transformers.

Provision for terminating one outgoing feeder cable.

1—Hinged steel panel.
1—Ammeter and transfer switch.
3—Relays, for overcurrent and short-circuit protection, induction type, with inverse-time characteristics and instantaneous element.
1—Reclosing relay, 3 shot.
1—Circuit breaker control switch, with red and green indicating lamps and maintaining contact.
1—Control-power switch.

Accessories consisting of

1—Transfer truck for the circuit breaker removable units.
1—Set of control jumpers for operating the circuit breakers in the disconnected position.
1—Emergency-manual-operating handle for the circuit breakers.
1—Manual handle for operating the circuit breaker isolating mechanism.
1—Inspection rack (when required) for the circuit breaker, with provision for electrical operation of breaker and for removing the breaker tank.

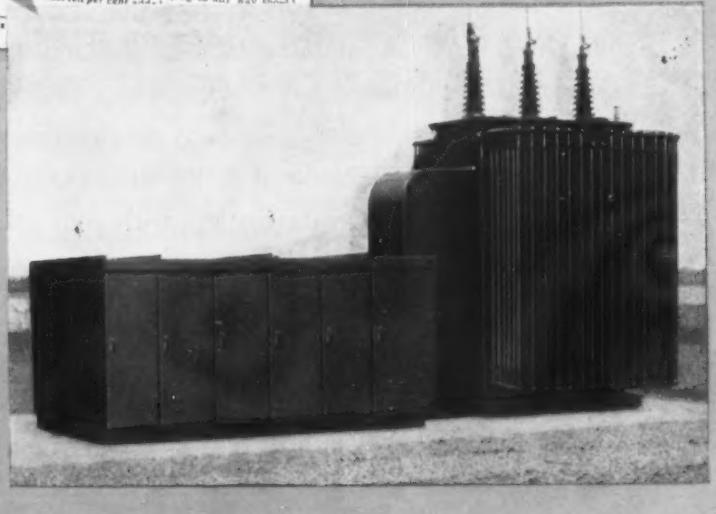
* This applies to units with load ratio control, units without L.R.C. will have 4-2½% rated kva taps, two above and two below rated high voltage. "p", "q", "r", "t" and "s" refer to Table A Page 7.

Supersedes issue dated Aug. 1, 1942. Minor changes.

Item		
1	Circuit Breaker Accessory House, Add	$800
2	Omit Automatic Reclosing (3 shot). Deduct per Feeder	$870

Units ***arranged differently*** in ***any*** respect from those listed above ***cannot*** be priced from the above schedules. They ***approximate*** prices for units varying in any way should be at least *ten per cent* additional.

Fig. 10



THIS 5000-kva unit substation with five feeders was ordered by a large war plant simply as "One Cat. No. US7J5 unit substation." The weeks of time and hundreds of dollars saved by the "one catalog number" method of ordering, to get a substation installed and operating sooner, is one of the many examples of planned efficiency in the war effort.

A COMPLETE SUBSTATION BY ONE CATALOG NUMBER

—a result of standardization and repetitive manufacture*

What G-E *unit substations* offer you:

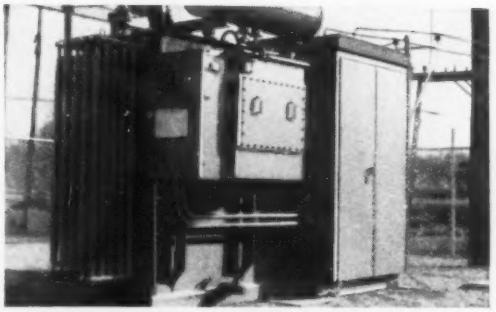
LOWER CAPITAL INVESTMENT. Unit substations have opened a profitable new field for electric-service company distribution engineers who right now are studying their systems with a view to avoiding unnecessarily large capital expenditures. The valuable time normally spent in worrying about substation-design details can now be much more profitably devoted to ***system*** engineering and planning.

BETTER SYSTEM OPERATION. A well-planned system, one which has completely automatic, standard ***unit substations,*** means fewer customer outages, better voltage conditions, and a lower equipment-failure rate. The dispersal provided by a number of smaller units, compared with one large, central substation, localizes troubles and prevents huge equipment losses as well as large-area outages resulting from fires, explosions, or other misfortune.

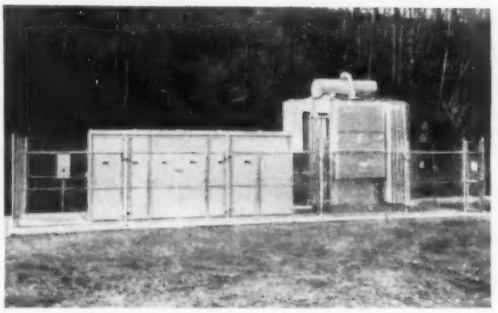
GREATER FLEXIBILITY. *Shifting* loads are easy to follow because these standardized units are relatively easy to move. ***Increasing*** loads are easy to handle by purchasing additional units as they are needed. This precludes the possibility of installing a large substation and waiting for a load which may never develop.

LOWER OVERHEAD. G-E *unit substations* are shipped directly to the installation site in completely assembled sections. You save the time and expense of passing hundreds of parts through stockroom or warehouse. You avoid the confusion of lost, delayed, or forgotten parts and duplicate pieces, rush orders, and consequent rehandling. Installation is always much easier and faster than it is with a piecemeal substation, and there can be a more efficient use of man power. Crews quickly become familiar with them because there are only two or three pieces to handle.

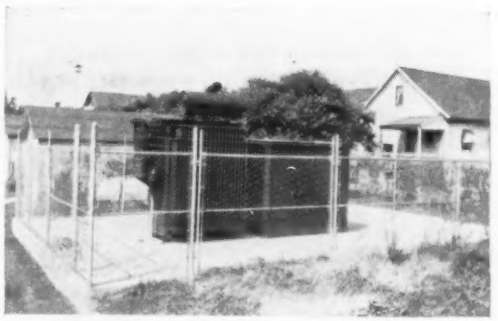
CENTRALIZED RESPONSIBILITY. The combined and co-ordinated efforts of General Electric's substation, transformer, switchgear, relay, meter, and application engineers assure the fulfillment of your specifications. The constant efforts of this highly trained group mean continued improvements in available standard unit substations—with lower and lower costs.



1000-kva unit substation—Cat. No. US2A1



1500-kva unit substation—Cat. No. US3A2



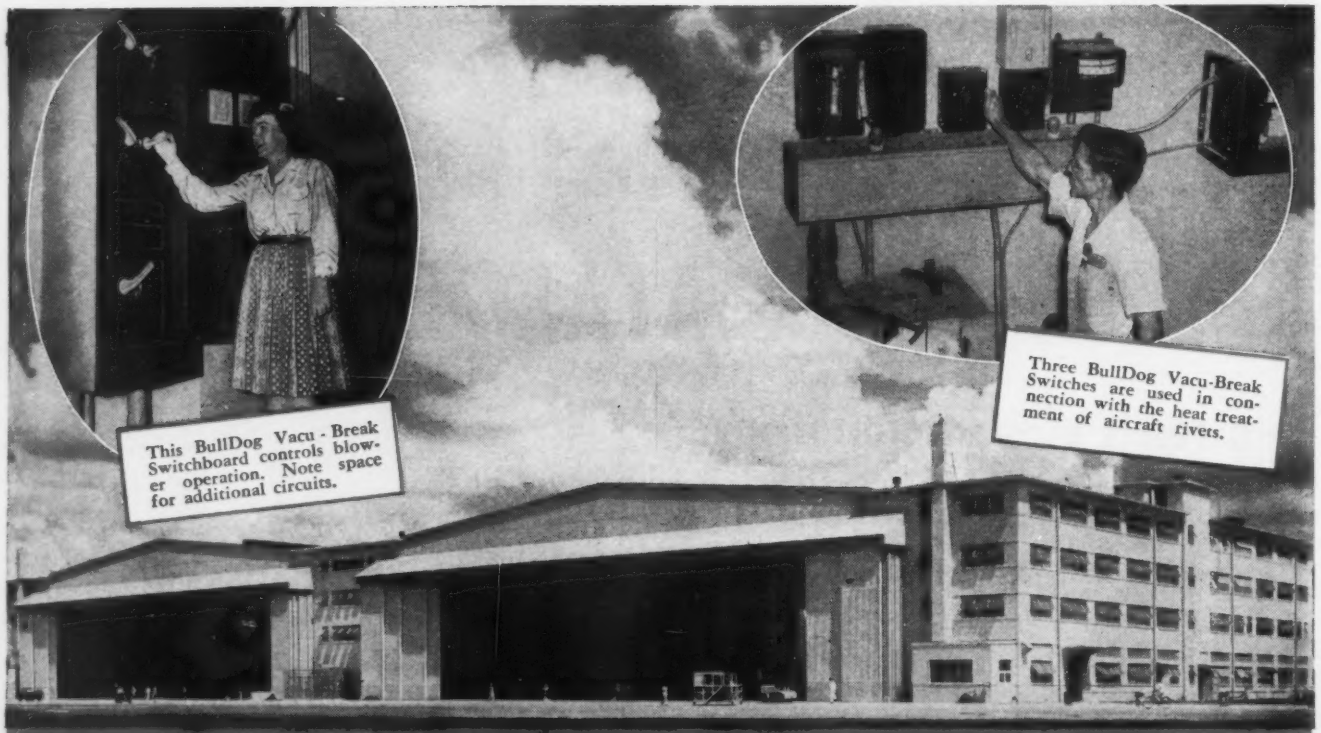
3000-kva unit substation—Cat. No. US5NE4

* ***G-E unit substations are now being built repetitively from standard components for almost any application you may have. Ask your G-E representative for Bulletin GEA-3800, or for a detailed presentation of our complete line in the light of your specific problem. General Electric Company, Schenectady, N. Y.***

GENERAL ELECTRIC

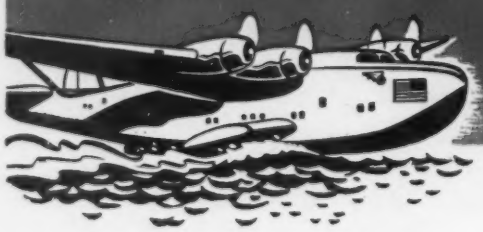
UNIT SUBSTATIONS

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.


This BullDog Vacu-Break Switchboard controls blower operation. Note space for additional circuits.
Three BullDog Vacu-Break Switches are used in connection with the heat treatment of aircraft rivets.

PAN AMERICAN CHOSE *Vacu-Break*

BullDog Switches and Switchboards Control Light and Power Throughout New Million-Dollar Miami Hangar



Constructed as a unit, the new Miami building illustrated above, includes three four-story shop and office buildings divided by two hangars.

Largest and costliest of all structures in the far-flung Pan American World Airways System is this giant maintenance and office building — a monument to U. S. leadership in the skies.

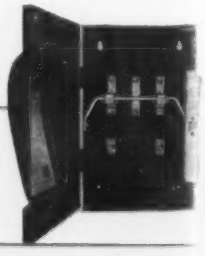
That BullDog electrical equipment is used to control light and power throughout this giant aircraft center is a tribute of which we are proud.

Choice of switches, switchboards, panelboards for such great installations is not lightly made. Decisions are based on superior design, greater safety and dependability, longer life and lower upkeep cost.

BullDog meets these requirements squarely and completely — with the famous Vacu-Break principle which assures the most positive action, maximum safety and minimum wear.

Whatever the electrical problems of your plant or offices, BullDog engineers can contribute to the results you want. Write today for a descriptive booklet giving full information.

BULLDOG
ELECTRIC PRODUCTS CO.
BOX 177, R. PK. ANNEX
DETROIT 32, MICHIGAN
BullDog Electric Products of Canada, Ltd., Toronto, Ont.
Field Engineering Offices in All Principal Cities



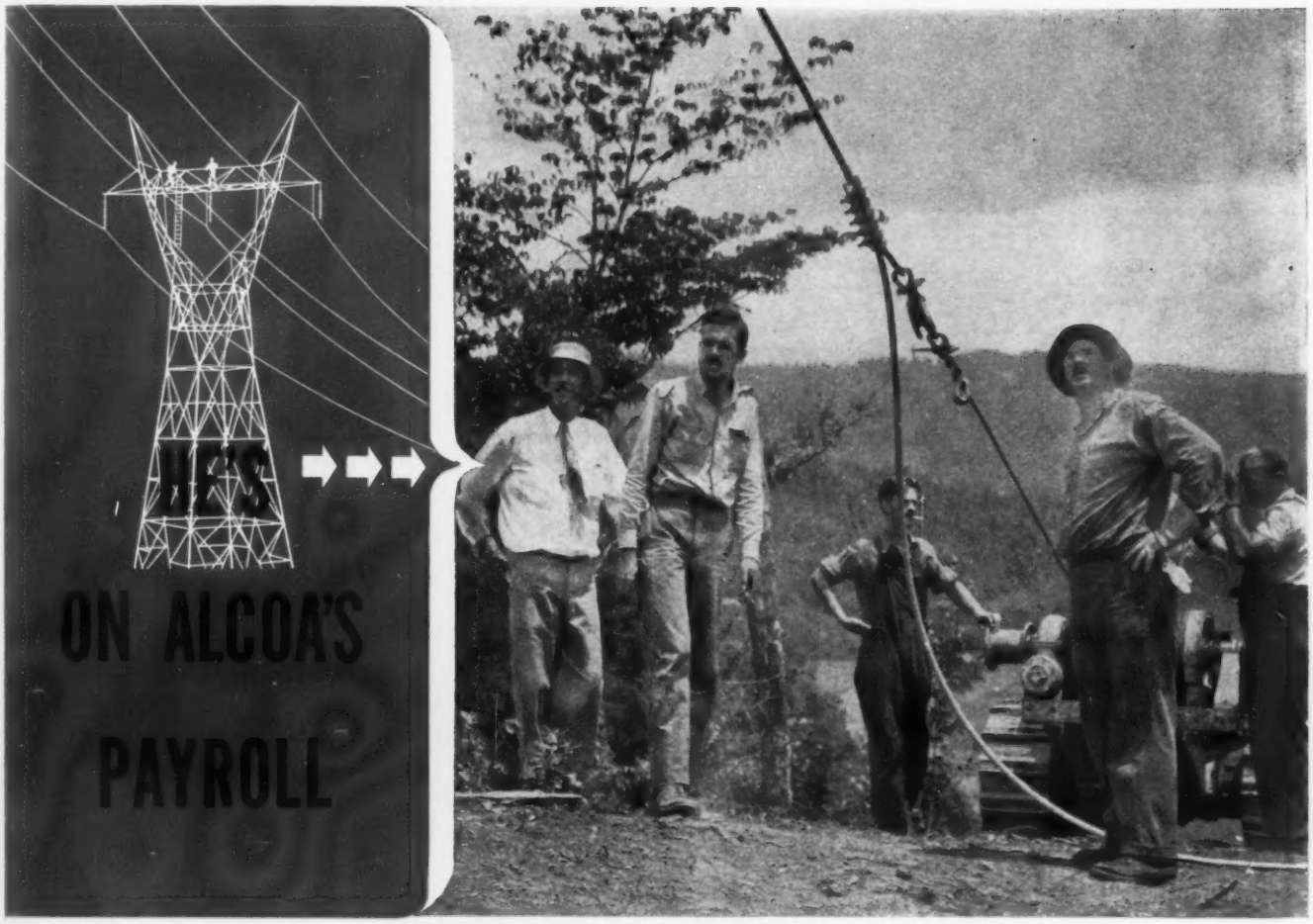
In addition to Vacu-Break Safety Switches, BullDog Electric Products Company manufactures a wide variety of products for power distribution and control, including SafToFuse Panelboards, Circuit Master Breakers, Switchboards and the three famous Bus Duct Systems — BUStribution DUCT, *for "plug-in" power,* Universal Trol-E-Duct, *for flexible lighting,* and Industrial Trol-E-Duct, *for movable "loads."*

BULLDOG PRODUCTS ARE SOLD AND DISTRIBUTED BY THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

Coast Electric & Manufacturing Co.
1720 N.E. Sixth Avenue
Portland, Oregon, Tel. Garfield 2844

Safety Switchboard & Manufacturing Co.
1445 Stevenson St.
San Francisco, Calif., Tel. Hemlock 2470

Mullenbach Electrical Manufacturing Co.
2300 East 27th Street
Los Angeles, Calif., Tel. Jefferson 2224



This A.C.S.R. line would doubtless have gone up just as well without this Alcoa supervisor on the job. But the power company's construction boss felt the need for him, so there he was.

He and the other Alcoa supervisors have been hard at work all during the war. In their advisory capacity, they've helped extend and prepare existing lines to meet added demands for war production. They have aided during storm emergencies and in securing badly needed materials. They have assisted in curing vibration troubles on all kinds of lines. (Stockbridge dampers play no favorites; they work on any conductor.)

This is service which Aluminum Company of America has always extended to users of A.C.S.R., during the many years Alcoa has been making aluminum conductors. It is service which will be continued.

When you order Aluminum Cable Steel Reinforced, specify ALCOA A.C.S.R.

Aluminum Company of America, 2132 Gulf Building, Pittsburgh, Pennsylvania.

Transmission and Distribution Line Equipment

KEARNEY EQUIPMENT

PORCELAIN INSULATORS

POLE LINE HARDWARE

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GLASS INSULATORS

WIRES AND CABLES

POLES AND CROSSARMS

HUGHES LINE STRUCTURES

PINS AND BRACKETS

GUY STRAND

GALVANIZED IRON WIRE

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CONSTRUCTION TOOLS

HARTZELL PROPELLER FANS

MAYDWELL & HARTZELL
INCORPORATED

Complete stocks at these points

LOS ANGELES SEATTLE
SAN FRANCISCO

BULLETINS

data books, etc.

Unit-Sub Rule (218)

Correct size air circuit breakers for industrial substation applications may be determined by means of a slide rule which Allis-Chalmers is offering.

This rule has been constructed from standard AIEE formulas for determining short-circuit currents and takes into consideration all necessary factors, such as motor load and d-c component. While it has been developed for use in load-center unit substation applications, the slide rule can be used to check breakers on any system. It applies to direct connected as well as cascaded breakers.

The engineering information contained in the Unit-Sub Rule is available in Monogram form in the company's unit substation bulletin B6285.

Electronic Control (219)

Fundamentals and applications of electronic control are described by General Electric Co. in a recent bulletin. The 12-page publication explains the fundamental principles of electronic tubes and their operation, describes the construction of a thyratron tube and lists functions of eight of the more widely used industrial type tubes. Also described are applications of electronic control, including rectification, resistance welding, timing and processing operations, as well as photoelectric installations involving counting, sorting, weighing, measuring, registering, illumination and control of cement kiln temperatures.

Power Factor Chart (220)

George S. May Business Foundation is offering a power factor correction chart of cardboard, permanently mounted.

Circuit Breakers (221)

Selection and construction of I-T-E circuit breakers is covered in a 32-page bulletin prepared by the company. The section on selection gives rules for approximating the necessary interrupting capacity of circuit breakers on both a-c and d-c systems. "Cascading" is explained, one table gives the allowable carrying capacities of wire and cable, both in free air and in raceways, and another lists the approximate full-load currents drawn by d-c and a-c motors from 1/8 to 1,000 hp.

The construction section includes schematic diagrams illustrating the trip-free operation of a circuit breaker when closing against a fault, as well as the normal open and closed positions.

Control Equipment (222)

Square D electrical control equipment meeting Marine and Naval requirements is listed and described in the company's new Bulletin 3100, superseding the temporary bulletin of April 1943. Equipment for use in yards and docks and typical shipboard layouts is described and illustrated.

Loose-Leaf Data Book (223)

Cannon Electric Development Co. is offering a 24-page loose-leaf booklet on signal system cable and wire data for engineers, estimators, wiremen and others in the electrical industry. The data include standard telephone cable color code, interphone telephone cable, switchboard telephone cable, wire types used in telephone and signal installations, resistance of copper wire, carrying capacities of wires. Pages are 4 x 6 1/8 in., three-hole punched.

Winter Overload Map (224)

Pennsylvania Transformer Co. has prepared a winter overload map of the United States, divided into five temperature zones with the overloads which can be carried. In charting winter temperatures the company used U. S. Government Weather Bureau Reports. These temperatures were used to determine the amount of overload that transformers can carry in specific regions throughout the country.

Line Shorting Contactor (225)

Railway and Industrial Engineering Co. is distributing a bulletin on its line shorting contactor, Type LSC, for high-speed switching. The device is described and technical performance data are given. A progressive scale included with the bulletin shows the sequence of function of each type of equipment during temporary and permanent fault, demonstrating how the line shorting contactor fits into a system.

ELECTRICAL WEST, 68 Post St., San Francisco, 4, California

Please send me information about following CIRCLED items:

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224 225

Name..... Company*..... Title*.....

Address.....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

4 NEW BRUSHES

Photographs Courtesy Boeing Aircraft

AFTER DETERMINING the cause of brush failure at high altitude on aircraft equipment, the Research Laboratories of National Carbon Company, Inc., discarded the practice of treating brushes by impregnation and developed a type of brush composition which produces a protective film on the commutator and assures satisfactory commutation and brush life under all service conditions—from take-off to ceiling.

As a result of tests in actual high altitude flights, four grades have been developed with characteristics that cover practically every type of rotating electrical equipment used on aircraft. Although designed primarily for operation at the low temperature, low humidity and rarefied atmospheric conditions of high altitude, these brushes also show highly satisfactory performance under comparatively high temperature and high humidity conditions at sea level.

GRADE AJS — A specially bonded graphite grade for high altitude operation on medium and high voltage commutators of dynamotors, 30-volt motors and other aircraft equipment not subject to excessive temperature conditions. This grade has fairly high contact drop.

GRADE AJZ — A graphite grade containing 25% copper adapted to high altitude operation on aircraft motors, interpole generators and similar applications. The contact drop of this grade is lower than that of Grade AJS.

GRADE AJT — A high altitude metal-graphite grade containing 50% copper and with low contact drop, it gives excellent service on 30-volt aircraft equipment such as motors, amplidynes, inverters, low voltage commutators of dynamotors, interpole generators and slip rings. Used at current densities ranging from 160 to 200 amperes per square inch.

GRADE ALP — A metal-graphite grade with approximately 65% copper and very low contact drop, for low voltage dynamotor commutators on which brush performance is affected by high altitude and because of the need for a grade of still lower contact drop than AJT.

These brushes have been developed for military aircraft. Both now and after the war, the research facilities of National Carbon Company will continue preeminently qualified for solution of brush problems imposed by the unceasing development of all types of rotating electrical equipment.

★ *BUY UNITED STATES WAR BONDS* ★

NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
UCC
CARBON PRODUCTS DIVISION, CLEVELAND, OHIO
General Offices
30 East 42nd St., New York 17, N. Y.
Branch Sales Offices
New York, Pittsburgh, Chicago, San Francisco

ELECTRA'S HUSBAND

Home Team Loyalty

ELECTRA certainly was mad the other night when I reached home. If there is anything she despises, it is disloyalty and that goes for everything from stepping off the home reservation to belittling the boss. An experience at Red Cross had set her off.

"It would serve your people right if the government took over your business," she fumed. "When the top men don't think enough of it to defend it, then it's time somebody else moved in and began running things."

One of the ladies in the Red Cross unit where Electra makes bandages owns a summer place. Among the many pieces of electrical equipment installed is an electric water heater. Gas rationing had cut down the frequency of trips from town to the country place to about one a month. Even so, the electric bill seemed high—higher as a matter of fact than it had been in previous summers when the place was visited every week-end.

Because he seemed to be the right person to hear such a complaint, the story was told to one of the local power company vice-presidents—"a friend of the family." It appears that he had the case investigated as a routine matter. The results were typical. The investigator's report read, "High bill occasioned by full-time operation of automatic electric water heater." Which was the case. The water heater was more than ten years old. The tank lagging was inefficient, and there was no insulation on the water pipes. Moreover a bathroom faucet leaked just enough to cause the pipe to serve as a perpetual radiator.

None of this was sufficient to set Electra to fuming. However, what the power company vice-president told the mutual friend was. He had said:

"Take the electric water heater out and put in butane. It will be cheaper."

Electra would like to meet that particular executive to tell him off. It would be worth hearing too, judging from the manner in which she once chided the district manager of one of the large manufacturers. She had found a big Grand Rapids ice box in the pantry of his house. Which was all right except that his company had been publicly plugging an electric refrigerator for five years.

ELECTRA is very much taken with the Idaho Power Co. motto —"A citizen wherever it serves"— which is displayed on letterheads and in advertising. She particularly likes the finer meanings of citizen—taxpayer, sharing responsibility for civic enterprises, a respected member of the community with all of the rights and obligations that go with citizenship.

MANPOWER (and womanpower) troubles afflict all businesses today. Not the least of them is the immaturity of some of the people who are working. If the problems were not so perplexing, some of the incidents would be sufficiently humorous to live long in the annals could they be recorded.

Take, for instance, the case of the San Francisco Bay area switchboard manufacturer. Into his drafting room went a young lad of twenty who, according to all tests, was capable and trained. For several weeks his performance measured up; then one morning he asked for an interview with the boss. He walked into the manager's office with a sheet of paper in hand and announced that he had some questions to be answered. The manager said he would do his best.

"How long do I have to work in this place before my first promotion?" was the first query.

"That depends," was the answer.

"When do I get my first raise?" was another; answer about the same.

"How long must I work before I get an executive position?"

"What kind of a future am I assured?"

"How about subsequent promotions and salary raises?"

As might be expected, the boss stood just about so much and then started a stern but simple lecture.

"Young man," he said, "I began in this company when I was sixteen as an apprentice out in the shop. My pay was $6 a week. It was four years before I was really promoted and it was ten years before *my* boss thought I had learned enough to bring me into the office . . ."

"All that may be true," the young hopeful interrupted, "but this generation is different. We learn faster."

"Is that so?" the boss said, reaching for the telephone. "Give me the cashier," he told the operator. "Bill? A young man named Joe Spelvin will call on you in a few minutes. I want you to have a check made out for him. Payment in full for services to date. That's all." And he hung up.

The youth didn't need an interpreter to tell him the full meaning of that conversation. As he turned to leave the boss' office, he said plaintively:

"I don't now what's the matter with me. This is the fourth time I've been fired in the last six months."

FROM a Canadian electrical magazine, Electra has learned that some weird new applications of electric energy are being developed. She gave me a clipping the other day with a mean twinkle in her eye. The following is quoted from it:

"In the year 1938 Cerletti in Italy discovered that passing a current of electricity through the head of a patient suffering from a certain form of insanity produced very beneficial results and it was learned with considerable interest recently that this stock therapy is being used in this province with considerable success. Apparently the types of insanity that respond are those that produce depression and melancholia; mental depressive conditions which have confined patients to Ontario mental hospitals for from six to eighteen months are now being apparently cured in three to four weeks. In catonic patients the shock treatment removes them from stupor to the extent that they can talk and eat. It brightens their entire outlook and permits them even to take part in occupational therapy.

"About 90% of the cases of depression so far treated in Ontario's thirteen mental hospitals have recovered or are well on their way to doing so. The treatment is regarded as one of the best answers so far discovered to cure maladies arising from the shocks and strains of wartime living. The method of application is simple and the effects on the patients are not regarded as upsetting."

The more I read that, the more I sense that Electra had an ulterior motive in mind. Or did she?

On Thanksgiving Day, a Westinghouse Supervisor in New York was just sitting down to his turkey dinner when a long distance call came through.

He ran out on the Turkey

BUT THE TANKER SAILED!

A tanker in Mobile, Alabama, about to sail for the war front, needed immediate replacement of two Micarta stern tube bearings.

The New York supervisor phoned three workmen to meet him immediately at the Westinghouse District *Manufacturing and Repair** Plant.

Micarta sheets were taken from the storeroom, saws and milling machines set up—and the bearings made, packed and shipped by 10:30 that night.

Forty-eight hours from the time the order was entered, the bearings arrived in Mobile. And the tanker sailed on time, to help supply an important military operation.

Westinghouse M & R men have the "know-how" that comes only from years of experience. Each plant is backed by the complete engineering, research and manufacturing facilities of the Westinghouse Company.

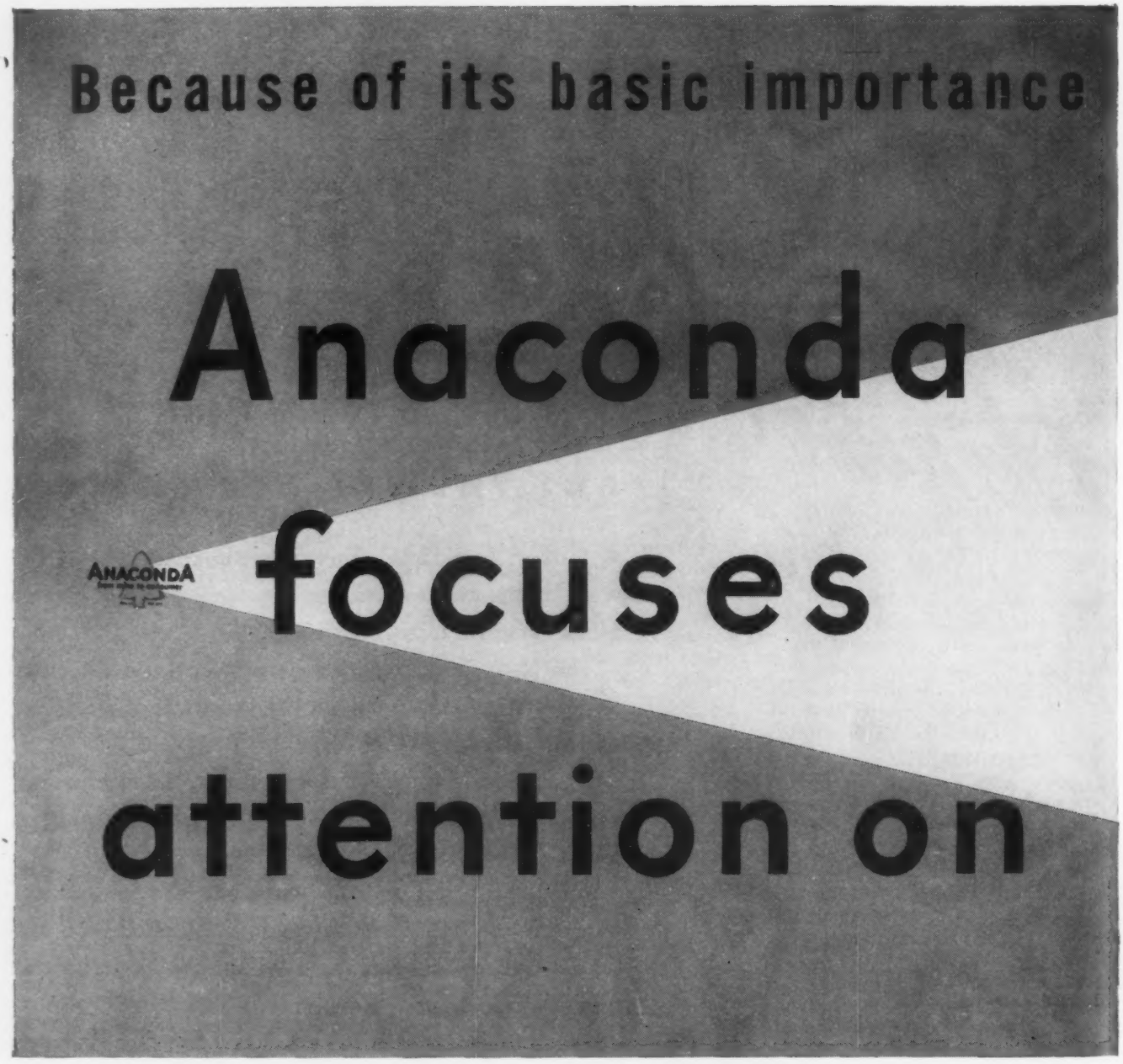
J-90502

When vital electrical equipment needs repair . . . phone the nearest office of Westinghouse Electric and Manufacturing Company for

Westinghouse

COMPLETE REPAIR SERVICE

***33 M & R PLANTS • • ONE NEAR YOU**



Nothing is more basic in furthering the interests of the electrical industry as a whole—and of each individual branch—than the promotion of electrical wiring. This has long been the number one belief with Anaconda Wire & Cable Company.

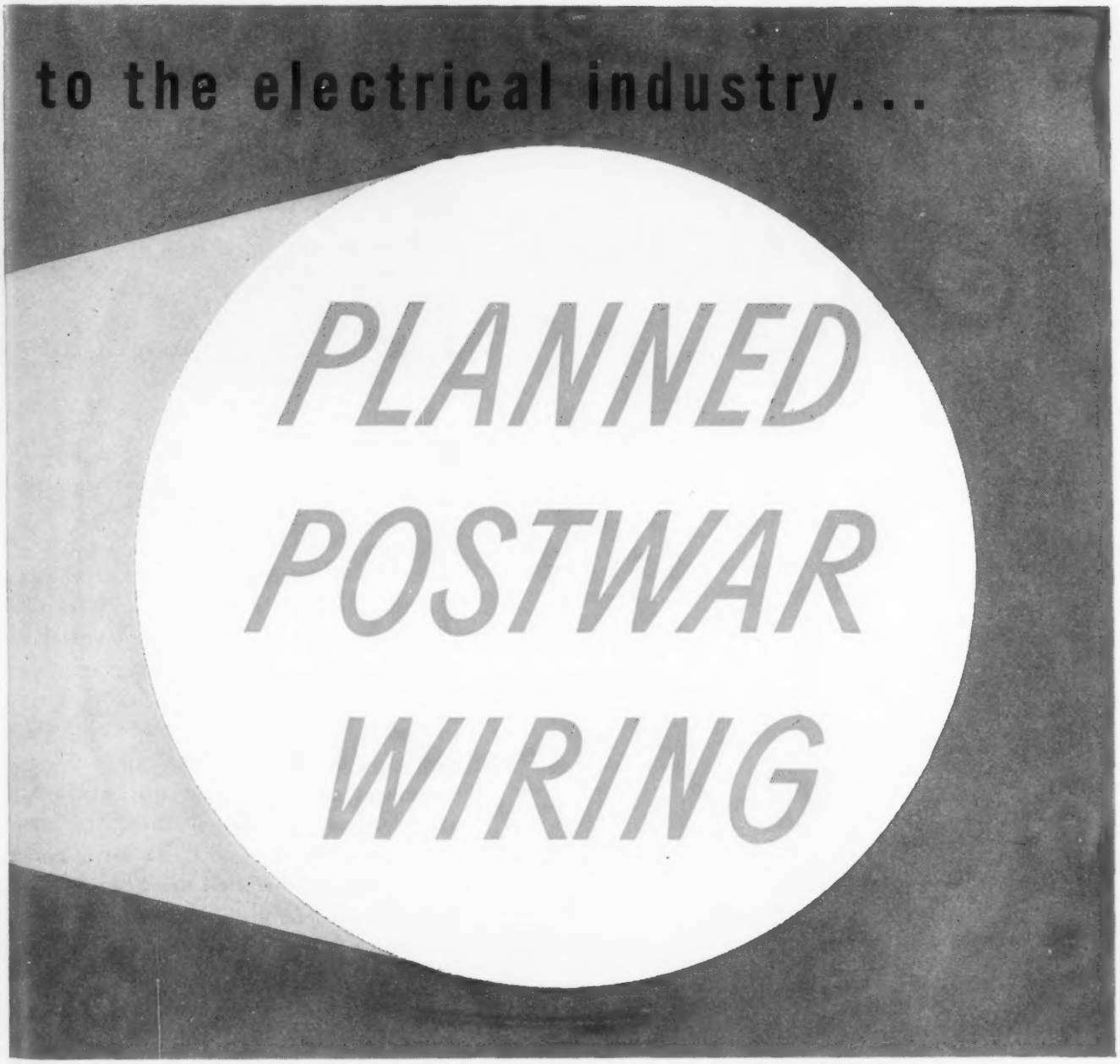
THE PAST

You probably recall the "Electrical Modernization" campaign of Anaconda prior to the war. It helped stimulate national interest in better wiring for Industry and helped to prepare Industry to meet the challenge of war production.

THE PRESENT

A more recent example is the "Preventive Maintenance" campaign developed by Anaconda engineers to meet wartime conditions. Based upon practical methods of conserving electrical circuits and equipment, it is being widely used.

Electrical Wires and Cables of Copper are the Life Lines of



THE FUTURE

Today, the time is ripe for another step forward in furthering adequate wiring. We believe we can render a constructive service to the electrical industry and to business in general through a national campaign promoting the importance of *postwar* wiring.

Its objective will be to stimulate *advance thinking* about adequate wiring...to drive home to industry, municipalities and home owners the vital necessity of including PLANNED WIRING IN EVERY POSTWAR PLAN!

THE IMPORTANCE

Obviously, more and better wiring will have to come *ahead* of tomorrow's more efficient industrial production . . . city improvements . . . new products . . . finer appliances . . . more livable homes. The wider the recognition of this, the better business for everyone . . . utility, contractor, wholesaler, manufacturer.

And now—in advance—is the time to lay the foundations. Postwar planning is gathering momentum. *Unwired* planning will benefit no one. *Planned wiring* will help everyone. 44227

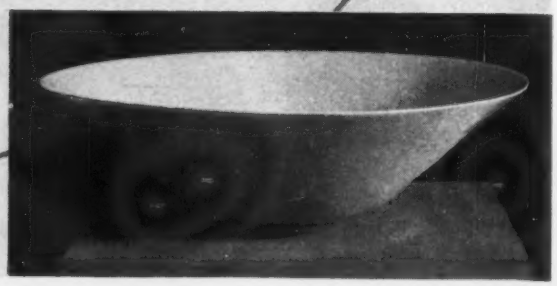
ANACONDA

ANACONDA WIRE & CABLE COMPANY

25 Broadway, New York 4 . . . Sales Offices in Principal Cities

...es of our Nation

Will O-B Bushings Last 1000 Years?



* *Cleveland Museum of Art*

Here is a delicate porcelain dish nearly a thousand years old. The layman might pass it by as "new merchandise". Aside from breakage, its fragile nature exposes it to all the forces of deterioration that ten centuries might bring. Yet it's still new! . . . What does this tell us about modern electrical porcelain? We know that, today, porcelain possesses excellent dielectric qualities; it is totally weatherproof, and small accidental electrical discharges across its surface cannot leave a permanent conductive scar that will eventually lead to break-down. These and many other reasons account for O-B's use of porcelain for **internal dielectric** in all bushings . . . But, this ancient dish tells us more about porcelain -- something that we haven't lived long enough to know ourselves. Porcelain is changeless. Its original qualities endure indefinitely. This dish adds an important chapter to the story of O-B porcelain-insulated bushings. It adds a vital time factor to the basic facts of porcelain's good insulating qualities.

Only in O-B bushings can internal porcelain dielectric be obtained. Specify these bushings for lasting performance.

Ohio Brass

MANSFIELD, OHIO

CANADIAN OHIO BRASS COMPANY, LTD.
NIAGARA FALLS, ONTARIO

2414-H

ELECTRICAL WEST

FEBRUARY, 1944
VOL. 92, NO. 2

ALL OUT FOR WAR

U. S. Marine Corps Photo.

TWO full years of wartime operation find the electrical industry inseparably geared to the drive for victory. And its achievements have been notable. No soldier on the fighting front can say that he has been denied plane, gun or shell because of any strike of electric power. Every war demand has been met without compromise, and at the same time unsurpassed civilian requirements have been supplied without rationing or curtailment.

Here in the Far West, particularly, the demands have been great and the performance superb. With only a fifth more generating capacity than the region could muster in 1941, over 50% more electrical energy was generated last year to maintain production in line with the emergency demands of total war. This performance was achieved with fewer people, in the face of a scarcity of materials, with dependence upon substitutes and in spite of plenty of natural obstacles.

But there were compensations for the sacrifices involved. Victory is nearer. No other industry could boast of a better record. A changing public attitude indicated that the people in general were ready to give the industry credit for its splendid job. And a new spirit of industry cooperation and solidarity was in the making. Finally, the promise of a new Western industrial empire was becoming a reality.

In mobilizing its resources for the war effort the electrical industry has been forced to streamline both operating procedures and personnel. Some of the shifts have been hard to make and hard to take. Others may become permanent. Obviously many temporary feminine workers will return to the home. Alternative materials and techniques of war-proven efficiency and performance will be retained as standard. And the industry hopes many war-invoked controls will be revoked.

Predictions of victory in 1944, at least on the European continent, tend only to increase the complexities of the war as applied to this region. Such an event temporarily would intensify every activity here in the West and would exert new pressures and strains. However, the electrical industry will be able to take this in stride. Its reserves make such a course possible.

As the turning point in the country's wartime way of life comes closer, the opportunities and the challenges to the electrical industry in this region become clearer. Wartime shortages of everything electrical promise huge markets. But then the closing down of many strictly war plants will leave a huge surplus of power. It is conservatively estimated that fully 1,500,000 kw. of capacity will be available for sale to old and new customers.

So far as the industry is concerned, its first job is to continue to put every human and material resource into the speedy winning of the war. However, the time has come for planning for the future. The size of the postwar job is great and its form is complex. Competition between industries will be keen. There will be the necessity for contributing to the preservation of the American way of doing things—a task not new to this industry. The emphasis will be on jobs, jobs, jobs, because full employment and full production mean economic prosperity and freedom.

Table I—Comparison of National to Western Operations for 1942 and 1943

	11 Western States		United States		Percent West to U.S.	
	1942	1943	1942	1943	1942	1943
Energy Generated (Millions of Kwh.)†	32,521	40,313	189,181	214,981	17.2	18.7
Energy Generated in Hydro Plants (Millions of Kwh.)†	28,466	35,513	64,179	74,568	44.3	47.6
Energy Generated in Fuel Plants (Millions of Kwh.)†	4,055	4,800	125,002	140,413	3.2	3.4
Percentage of Hydro to Total Generated	87.5	88.0	33.9	34.7	...	...
Installed Generator Capacity (Kw.)†	7,281,481	8,184,830	46,139,255	48,658,527	15.8	16.8
Installed Hydro Capacity (Kw).†	5,065,184	5,696,242	12,859,873	13,821,813	39.4	41.1
Revenue from Energy Sales (Thousands of Dollars)‡	381,000	418,000	2,855,843	3,096,600	13.3	13.5

† Source—Federal Power Commission. ‡ Data from EEI.

Table II—Ten-Year Generation Record for Western Public Utilities

(Thousands of Kilowatt-hours)

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943*
Arizona	295,668	344,939	377,797	510,483	717,825	696,787	1,327,485	1,404,299	1,459,689	2,630,936	3,205,745
California	8,029,298	561,951	9,080,296	10,091,716	9,632,178	9,426,519	9,403,588	9,788,869	10,383,352	11,583,154	14,394,085
Colorado	459,493	506,710	549,157	652,404	721,482	731,395	760,445	791,967	818,213	977,690	1,040,021
Idaho	594,528	685,069	672,466	796,430	972,212	992,278	1,126,518	1,175,305	1,142,341	1,244,946	1,330,541
Montana	922,814	867,504	1,296,199	1,452,390	1,319,637	1,324,151	1,575,016	1,769,124	2,177,623	2,248,133	2,582,210
Nevada	24,271	32,152	27,719	171,499	1,152,788	1,491,205	1,855,042	2,324,176	2,403,747	2,432,124	3,220,748
New Mexico	157,482	173,229	190,744	214,602	255,378	262,124	281,508	316,862	368,449	409,854	466,215
Oregon	965,847	1,002,338	1,083,818	1,250,421	1,392,177	1,253,615	1,484,468	1,739,903	2,909,772	3,651,159	4,587,305
Utah	237,399	206,706	309,835	418,194	507,415	340,172	425,474	577,641	564,812	604,393	614,138
Washington	2,438,824	2,747,366	2,981,621	3,273,148	3,734,715	3,400,683	3,642,610	3,944,184	4,499,031	6,494,920	8,583,774
Wyoming	78,964	81,856	93,779	114,755	131,139	139,205	141,135	184,701	217,343	243,697	288,163

*F P C reports for 12 months ending November.

Table III—Number of Utility Customers at End of 1943*

State	Residential	Rural†	Commercial and Industrial Small	Commercial and Industrial Large	Public Agencies	Railway and Misc.	Total
Arizona	98,000	500	16,100	180	236	14	115,030
California	1,895,700	298,800	350,000	6,670	12,591	239	2,554,000
Colorado	221,500	12,400	37,500	6,900	788	12	279,100
Idaho	108,000	4,500	20,400	470	238	2	133,610
Montana	96,000	0	21,200	1,880	318	92	119,480
Nevada	26,500	0	5,000	100	50	0	31,650
New Mexico	61,000	0	12,500	90	260	0	73,850
Oregon	275,000	8,700	40,000	2,400	1,694	6	327,800
Utah	144,000	100	17,200	30	609	1	161,850
Washington	502,000	20,000	62,000	5,200	2,258	42	591,500
Wyoming	43,000	400	7,100	980	140	0	51,260
11 Western States	3,470,700	335,400	589,000	24,900	18,982	408	4,439,500
United States	26,817,700	1,182,300	4,133,000	152,300	108,384	1,316	32,395,000

Table IV—Type and Capacity of Utility Generators, November, 1943

State	Companies*	Plants	Total Capacity Kw.	Generator Capacity in Kilowatts of Plants Operated by (a) — Water Power No.	Water Power Capacity	Steam Power No.	Steam Power Capacity	Internal Comb. Engines No.	Internal Comb. Engines Capacity
Arizona	22	55	676,639	15	540,790	13	92,325	27	43,524
California	36	164	3,127,634	118	1,706,425	32	1,371,952	14	49,257
Colorado	40	87	355,602	30	90,385	28	248,499	29	16,718
Idaho	20	61	470,433	45	266,100	2	620	14	3,713
Montana	19	38	373,824	22	358,473	5	12,318	11	3,033
Nevada	9	17	511,284	11	503,775	1	4,050	5	3,459
New Mexico	21	45	146,610	5	25,157	12	99,879	28	21,574
Oregon	31	79	854,137	52	658,727	18	190,640	9	4,770
Utah	27	75	168,897	58	92,185	3	66,250	14	10,462
Washington	31	89	1,610,430	48	1,404,535	14	203,870	7	2,025
Wyoming	28	50	89,340	14	49,690	15	34,207	21	5,413
11 Western States	284	470	8,184,830	418	5,696,242	143	2,324,610	179	163,978
United States	1,795	4,098	48,658,527	1,566	13,821,813	1,193	33,778,641	1,339	1,058,073

(a) For combination plants each type of prime mover is counted as a separate plant.

* Includes duplications because of utilities operating in more than one state.

Source: Federal Power Commission

Table V—Distribution of Government War Contracts, June 1940-October 1943

All Figures Millions of Dollars

State	Grand Total	Army, Navy, Mar. Com. Treas. and Foreign(1)	Supply Contracts: Aircraft	Supply Contracts: Ships	Supply Contracts: Ordnance	Supply Contracts: All Other	Facilities: Industrial	Facilities: (2) FPHA	Facilities: (3) WPA	Facilities: (4) RFC	Facilities: All Other	Total Non-Industrial
Arizona	305	273	33	...	...	20	95	21	5	2	93	125
California	15,581	15,163	8,705	3,491	307	821	840	281	39	37	642	999
Colorado	583	562	1	2	176	75	135	6	7	2	158	173
Idaho	134	122	...	1	a	7	19	6	2	a	88	96
Montana	71	62	...	...	a	12	12	3	3	a	30	38
Nevada	241	224	...	a	a	12	143	15	a	a	53	68
New Mexico	116	101	...	...	a	2	4	6	3	a	86	95
Oregon	1,310	1,190	a	834	9	121	84	68	10	27	57	142
Utah	606	562	a	...	152	8	258	32	3	1	107	143
Washington	4,291	4,066	1,364	1,816	53	274	279	169	14	11	85	279
Wyoming	59	52	12	...	...	4	36	3	1	a	17	23
11 Western States	23,297	22,377	10,116	6,144	694	1,356	1,905	610	87	82	1,400	2,181
United States	175,339	170,768	44,999	22,000	32,735	40,953	30,080	2,071	515	1,111	10,323	14,020

(1) Prime supply contracts and facility projects. Defense Plant Corporation and RFC commitments for industrial facilities are included.

(2) Federal Public Housing Administration—Awards for housing through September 1943

(3) Federal Works Agency, Works Projects Administration—Expenditures on certified war projects from July 1940—April 1943

(4) Reconstruction Finance Corporation—War loan commitments for working capital and non-industrial facilities through September 1943

(a) Less than $500,000

HIGHLIGHTS

Production: An all-time record

Western generators turned out 40,313 million kwh. in 1943, up 24% from 1942 and 50% from 1941. Hydro contributed 88% of the total. The West now generates almost half of U. S. hydro power.

Energy Use: Leads nation

While requirements of Western war and civilian customers rose 24% in year, national increase was only 14%. Western generation per customer for 1943 was 9,080 kwh., national, 6,640 kwh.

Capacity: Exceeds 8 million kw.

Wartime requirements boosted Far Western power plant capacity to 8,184,830 kw., 16.8% of U. S. total. Hydro plants now rated at 5,696,242 kw., steam and diesel plants at 2,488,588 kw.

New Plants: Record increase

New capacity operating for first time totaled 1,118,250 kw., an all-time record for region. Hydro contributed 837,750 kw. For 1944 increase will be 540,000 kw.—all hydro.

Generators: Work longer hours

Wartime chemical and metallurgical plants forced generators to work an average of 5,210 hours per year contrasted with 4,595 hours in 1942. For U. S. figures were 4,611 and 4,147 hours.

Reserves: Adequate for war demands

In December 1943 margin of dependable capacity over peak demands was 15% for Western states. Because war construction of new industrial facilities is finished, this appears adequate.

Power Pools: Conserve resources

Pacific Southwest and Pacific Northwest power pools, nation's two largest, assure ample power for war loads. Southern pool saves 100,000 bbl. of oil, northern 100,000 kw. of new capacity.

Expenditures: Held down by war

Money spent by utilities for new construction in 1943 was only $83,470,000 (exclusive of federal funds). Of the total $41 million went for new station capacity.

Budgets: Victory would increase them

Continued strict control of essential materials (despite actual surpluses) will hold 1944 construction down to $42,500,000. If war in Europe ends soon, the figure could be $55,000,000.

Customers: Increase despite war

As population in the Pacific states continued to grow, so did the number of customers. Total served is now 4,439,500, up 55,000 from last year. Wired homes now total 3,470,000.

War Industry: Peak reached

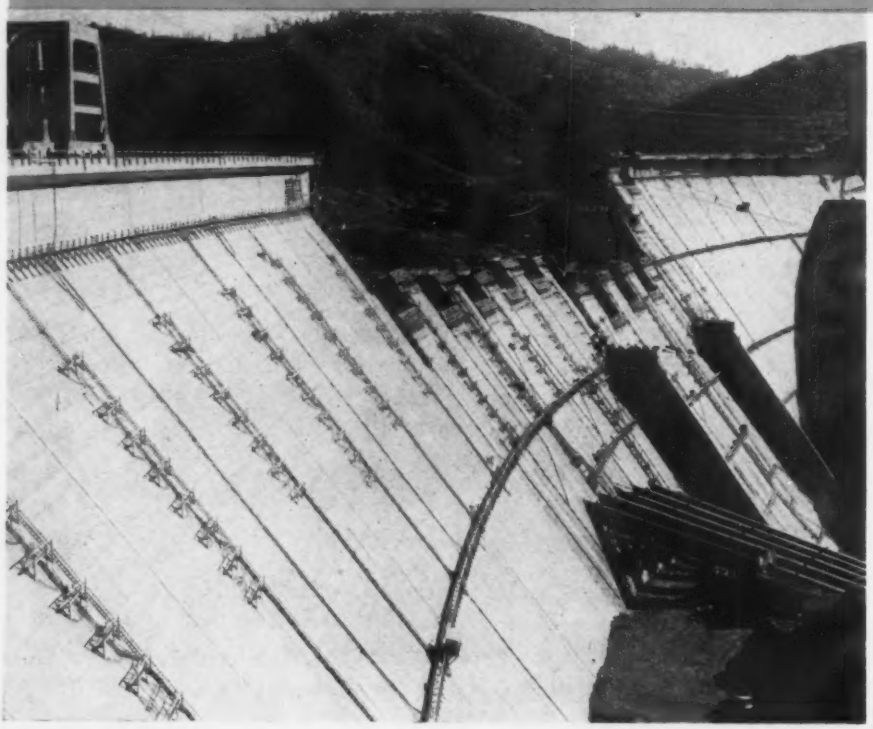
Contracts for war materials tapered off toward end of 1943 because of manpower. Western states total is $23,297,000,000. Most important is $1,905 million for new industrial plant capacity.

Postwar: Pattern evolving

As victory comes closer, electrical industry's role in Pacific industrial empire is clearer. Power capacity ready for sale and utilization will exceed 1,500,000 kw. Planning has started.

WESTERN POWER AT WAR

New Generation Totals 1,118,250 kw.



THE year 1943 was distinctly a year of *Power At War* in the far Western states. War production was about at its peak and, along with it, new generating capacity installed reached the record figure of 1,118,250 kw. Of this, 837,750 kw. was hydro and 280,500 kw. steam. Reports from utilities and government power agencies indicate by contrast only 540,000 kw. planned for 1944—all hydro.

Those familiar with the power business of the eleven Western states, of course, knew that a large amount of generation was to be brought in last year to meet war needs and that 1944 would see construction tapering off; but many will be surprised at these

Top: Perched on a rocky promontory is one of the steel towers carrying 230-kv. line between Bonneville and Coulee

Left: Shasta Dam in the Central Valley Project is nearing completion. Storage of water started Jan. 1. Two 75,000-kva. units will be in operation July 1

actual figures that show the situation in bold relief. It is a little early to speak for 1945, but all indications are that new generating capacity added will be practically nil.

This heavy generation program of 1943 saw major transmission line and substation construction activity to distribute this great block of power. Substation capacity installed almost exactly matched generator capacity with 1,119,500 kva. added. The bulk of the new generation was distributed through existing transmission, but nevertheless there was added 180 miles of 220-kv., 164 miles of 154-kv. and 360 miles of 110-kv. transmission.

At the turn of the year there remained under active construction only three major new power projects, Shasta, Pit and Nisqually. The first two 75,000-kva. units at Shasta power house of the Central Valley Project in California are due to be in production about the first of July. Pit River 5 plant of Pacific Gas and Electric Co., will be completed in May with four units totaling 160,000 kva., and a 40,000-kw. unit on the Nisqually project of Tacoma City Light will be ready May 1 of this year. One more 108,000-kw. generator will be added at Grand Coulee on the Columbia and is scheduled to go into service during February 1944. Installation of unit N-7 at Boulder Dam will be completed during the year, adding 82,500 kva. there.

Little additional war load remains to be served on the Pacific Coast and capital expenditures for the coming year will be less than the $53,800,000 budgeted for 1943 by the operating utilities exclusive of federal agencies. Considerable deferred maintenance has accumulated, but only the most urgent can be undertaken until materials and manpower are available. An attempt was made to bring out the dollar value of this deferred maintenance but reports were either incomplete or vague.

Reports appear alphabetically under states:

Arizona 58
California 59
Colorado 67
Idaho 69
Montana 70
Nevada 70
New Mexico 70
Oregon 70
Utah 73
Washington 74

Photo sources: p. 56, Bonneville Power Administration and USBR; pp. 58-59, Pacific Gas and Electric; p. 62, USBR; p. 63, San Diego Gas & Electric; p. 69 USBR; pp. 72-73, Bonneville.

The fine reports here presented carry an implied challenge to the industry's utilization or commercial men. It might be stated thus: "We men of the production department have our problems well in hand and after the war we will have hundreds of thousands of kilowatts, yes about a million and a half, ready for you utilization men to put to work. This is your challenge—to create the markets."

One thing evident, however, is that the cost of bringing utility properties back to prewar standards has probably been overestimated in the minds of many. Reports show that the larger utilities serving the major war loads have of necessity had to do about the usual amount of maintenance work in order to furnish the high grade of service demanded. The greatest deferred maintenance, then, is to be found on the smaller properties.

Forty reports in the pages that follow indicate that power men have learned two significant things from wartime operation: First, that war-born pooling of power resources marks a new era in the power business and second, that many wartime practices and substitutes have peacetime merit.

So successful and of such economic importance has been the operation of the two great power pools in the West, one in the Pacific Southwest and one in the Pacific Northwest, that benefits will likely be carried over into peacetime by continued operation. With 2½ million kilowatts of federal power developed in the West, the most economical means of making this power available to the largest number of customers in the greatest area is by utilizing these power pools to distribute it through the far flung utility systems that already interlace the West to its furthermost corners.

The power pool has brought new operating problems calling for telemetering, load control equipment, more adequate and dependable communication facilities, better and faster relaying schemes, higher interrupting-capacity circuit breakers and many others. Several of the reports indicate active programs along these lines and many new installations planned.

Power men have come to the realization that many wartime practices and substitutes have peacetime merit. A number of the reports show that engineers see ahead important economies that can be effected in power distribution from continuation of some wartime practices and also from the somewhat changed point of view of the industry.

The summaries that follow have been provided through the generous cooperation of executives and officials of private and municipal systems and governmental agencies, for which the editors are grateful.

Federal

Bureau of Reclamation

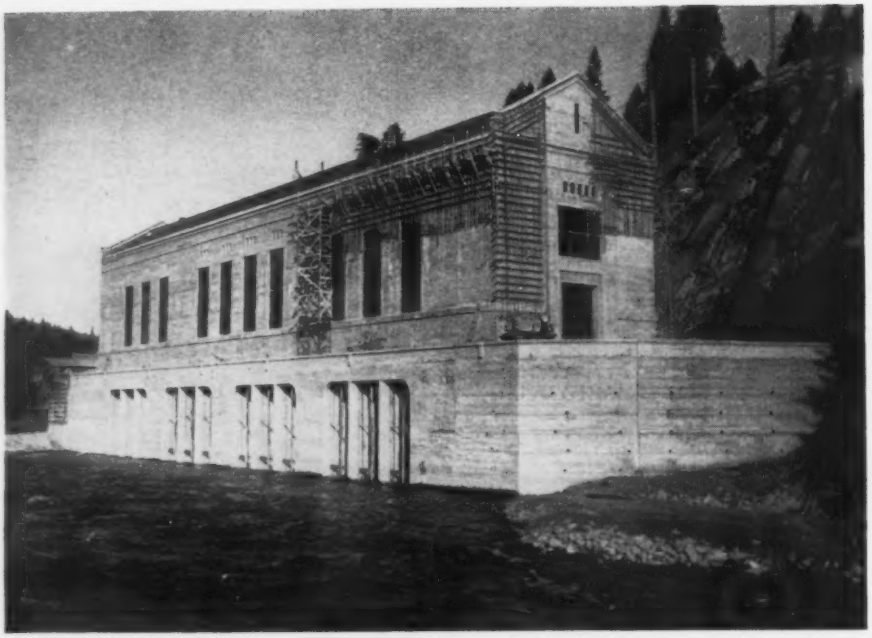
CURRENT appropriations and unexpended balances totaling approximately $104,998,000 are available for carrying forward the construction program of the Bureau of Reclamation during the fiscal year ending June 30, 1944. The sources and amounts of these funds are as follows:

Appropriation by Congress from Reclamation Fund	$11,118,000
Appropriation by Congress from General Treasury	93,880,000
Total	$104,998,000

Due to restrictions on the use of critical materials and labor many of the bureau projects have been closed down by order of the War Production Board. Inasmuch as the time that these projects may be released for construction, depends upon war conditions, the present construction schedule is indefinite. It will be realized that the program of the principal work proposed for each project is dependent on approval of priority applications submitted, or to be submitted to the War Production Board. The principal work accomplished in the fiscal year 1943, together with that proposed for the fiscal year 1944, is briefly described for each project under the state head in which the work is located. A tabulation of USBR power development appears on page 67.—*O. S. Harper, chief engineer.*

Bonneville

DETAILED activities of the Bonneville Power Administration are reported on page 70. The Army Corps of Engineers report on the Bonneville power house is on page 71.



Pit 5 plant of PG and E is one of three major hydro projects under construction in the West. Will be completed in May with four units totaling 160,000 kva.

REA

THE main development in rural electrification in the West during 1943 was the connecting of thousands of farms producing food for the war. In January 1943, the War Production Board lifted the prohibition against new construction to the extent of permitting the connection of farms adjacent to existing power lines under certain conditions which promised an increase in food output because of electricity.

During the fiscal year ended June 30, 1943, the number of farms connected to the lines of private utilities, REA-financed cooperatives and public power districts, in the Western states increased by a net of 9,000. This brought the percentage of electrified farms up to 65.2 in the 11 states west of the 100° meridian. An estimated 177,000 farms in this region still were without central station service.

Labor scarcities and the need to produce more food resulted in greater use on previously electrified Western farms of such electrical equipment as water pumps for livestock, brooders, milking machines, cream separators and feed grinders. The limited supply of manufactured equipment was augmented by the home construction of pig and chick brooders and other simple electrical devices.

Gross revenues of the REA borrowers in the 11 Western states amounted to $3,435,615 in the fiscal year ended June 30, 1943 as compared with $2,988,913 during the preceding year.

A total of $40,748,767 had been allocated by REA to borrowers in these states, of which $28,864,229 has been advanced as loans. The status of the REA borrowers is given in the table on pages 60-61.—*Information Division.*

Arizona

Arizona Power

TOTAL capital expenditures for the electric department for 11 months ending November 1943 were $12,740. These were mainly for short extensions to some mining customers and for renewals and replacements to our distribution system.

We have very few loads on our system that are associated with direct war activities. There were no additions made to our generating plants and no extensions of our transmission lines during the year.

Expenditures contemplated for 1944 are small and are mainly for renewals and replacements to distribution system.—*Malcolm M. Bridgwater, general superintendent.*

Central Arizona L. & P.

EXPENDITURES for additions to our electric property during 1943 amounted to approximately $459,000. Major items included a new boiler and spray pond at the steam electric station $340,000; transmission line reconstruction and replacements $10,000; 66- and 12-kv. substations $10,000; distribution lines and services $60,000; 2,400-volt capacitors $2,000; distribution transformers $20,000; and electric metering $13,000.

Our 1944 budget is estimated to be approximately $170,000. Major items are as follows: completing additional boiler and spray pond $30,000; 66-kv. transmission lines, substations, reconstruction and replacements $35,000; additional distribution substation transformer capacity $14,000; improvements and reconstruction of electric distribution system and services $66,000; distribution transformers $5,000; and electric metering $15,000.

The completion of the new boiler and spray pond will add approximately 9,000 kw. to the capacity of the steam electric station. Last year 27 miles of new distribution lines were added but no new transmission lines were constructed.

One 750-kva. 66/4-kv. substation and one 1,500-kva. 12/4-kv. substation were added last year. Approximately 230 kva. of capacitors were installed on the 2,300-volt distribution system.

Only necessary reconstruction, revamping and new construction is being done in view of the critical material and labor situation. Some deferred maintenance is contemplated as soon as materials and labor are available.

A postwar construction and maintenance program is contemplated as we anticipate very little load slump due to cessation of hostilities.—*L. K. Doutrick, vice-president and chief engineer.*

Salt River Valley Assn.

THE association has no report to make as capital expenditures were only nominal and were mostly for improvements to increase the efficiency and for better operation of the system. The total expended was $268,000 of which $18,000 was for production plant, $100,000 for transmission plant and $150,000 for distribution plant.

There is no construction program contemplated for 1944 as present facilities seem adequate for anticipated load.—*F. L. Roe, superintendent of power.*

Tucson G., E. L. & P.

NO generation or transmission facilities were added during 1943, and additions to distribution were negligible.

A total of 3,305 kva. of transformer capacity was added at substations. No synchronous, 180 kva. in static capacitors were added.

Deferred Maintenance ($ Value)

Steam	None
Hydro	None
Transmission	None
Transmission Substation	None
Distribution	$45,000
Distribution Substation	None

Deferred maintenance work will be done as rapidly as feasible. Normal maintenance work has not been done for some three years.

No after-war slump in loads is contemplated. It is believed that the major part of war loads will be permanent. Those others that will have to be dumped will be offset by increases in normal loads.—*M. A. Pooler, president and general manager.*

California

Burbank Public Service Dept.

GENERATION—Capital increase during 1943 was approximately $300,000 for the electric utility system as a whole. About $150,000 was expended to finish the installation of the second 10,000-kw. steam-electric generating unit which was placed in operation in July 1943. The second unit is an exact duplicate of Unit No. 1 except that slight changes in design were made in order to increase the full load efficiency. This increases the total generating capacity to 20,000 kw. Some engineering investigation may be done on a third unit during the next year; however, installation must be deferred until after the war because of priorities and deliveries.

Transmission—No important changes or additions have been made to the 34.5-kv. transmission system during the year 1943. The transmission system consists of a five-section loop system, three sections of which are protected by means of high-speed differential pilot-wire type relays. In order to increase reliability, the two remaining line sections will also be equipped with new high-speed pilot-wire relays. This project has been approved by the WPB and the relays will soon be purchased. During the latter part of the year the installation of a remote control system for the oil circuit breakers on the transmission loop was completed.

A heavy increase in load at the Lockheed Factory "A," which is now contemplated for the near future, probably will require a small addition to our 34.5-kv. transmission system during the early part of 1944.

Distribution—Very little change has been made in the 4.3-kv. distribution system. No new lines have been added other than extensions to serve new loads, one of which was a 1,500 ft., 2/0 underground circuit along the south side of the Lockheed Air terminal to supply a large service hangar.

Construction by the U. S. Engineer Corps of flood control drains and a comprehensive camouflage system over an aircraft factory and nearby plants has just been completed.

In general, changes and additions to the distribution system as a whole during 1944 will be confined only to those made necessary by increased load. However, a contemplated increase in load near one of the air terminals will require the construction of a new 34.5/4.3-kv., 10,000-kva. distribution substation by May 1944.

Substations—During the year 1943, small consumers' distribution substations were installed with a total capacity of 3,600 kva. These stations varied in size from 1,500 kva. down to 150 kva. transformer capacity. Also, during January, the 5,000-kva., 34.5/4.3-kv. Ontario substation was placed in operation. This substation was installed near an air terminal to supply 4.3-kv. energy to the industrial load in that area and relieve the main Burbank distribution substation which is now loaded to capacity.

Lockheed Aircraft Corp. is now working on an expansion program which will require approximately 5,500 kva. additional power at 4.3 kv., during the first five months of 1944. To provide for this increase in load, it will be necessary to construct a new 34.5/4.3-kv. substation near the Lockheed Factory "A" which will have two 5,000-kva. transformer banks and six 4.3-kv. distribution feeder circuits. This substation will be connected into the 34.5-kv. loop transmission system, and will be designed for remote control from the main control board located at the steam plant, which is approximately 2½ miles away.

The remaining 5,000-kva. transformer bank which was one of two banks originally installed at the Burbank switching station will be used for this substation. It will be replaced by a bank of three 3,333-kva. single-phase transformers.

General—As during the year 1942, system improvements have been limited to those which were absolutely necessary to render adequate service. The department has rigidly adhered to WPB regulations to conserve critical materials and man-hours. Maintenance standards have been lowered and all work possible is being deferred for the postwar period. Apparatus is being loaded to the limit and all available spare equipment has been pressed into service. After the war much new construction and rebuilding will be necessary to fully restore the fine quality of service recognized as standard by the department.

The annual system peak demand is 22.2% higher than for the previous year, and is somewhat higher than had been anticipated. Lifting of the dimout regulations was responsible for part of this increased demand. Energy consumption is up 25% over 1942.

A large portion of our total load is due to the very rapid growth of the airplane industry in Burbank, and we anticipate that our load will, at the conclusion of the present war, probably be reduced by 50% or more. It may take as many as ten years in which to recover this load. However, since the department is buying such a large amount of power, it is probable that it will be necessary to add generating capacity when steam-electric generating equipment is again available.—*J. H. McCambridge, general manager.*

Two of the four 35,000-kva. synchronous condensers being installed at a Pacific Gas and Electric substation preparatory to receiving Pit 5 and Shasta power

California Electric Power

CONSTRUCTION expenditures authorized in 1943 totaled $653,900, including $5,988 for generation (miscellaneous small items); $57,626 for transmission; $329,412 for distribution; and $223,814 for substations. A total of $919,300 is proposed for construction in 1944. The 1943 expenditures were as follows:

Transmission — repoling, $29,682; modernization of switching stations, $8,309; line relocation to clear railroad right-of-way, $18,632; miscellaneous small items, $1,003.

Distribution—26 miles of line added; repoling $32,259; extensions for new customers, reconstruction and modernization of existing lines, $297,153.

Substations—7,650 kva. of transformer capacity added, 5,250 kva. at existing and 2,400 kva. at four new substations. Of this amount, 1,800 kva. was for military establishments, 3,425 kva. for service related to war industries and 2,425 kva. for service to essential industries. Other substation improvements included: addition of high-voltage metering installations; addition of transformer cooling facilities; modernization of switching and relay installations serving essential loads; replacement of station storage batteries and realignment of control facilities on account of changed operating conditions required by connection to an important military load.

Proposed 1944 Construction

Generation	$ 59,300.00
Transmission	84,700.00
Distribution	371,500.00
Substations and Equipment	249,300.00
Other System Improvements	154,500.00
	$919,300.00

Principal items budgeted for 1944 are: Distribution lines, including new lines, reconstruction of existing lines, repoling, reconductoring and reinsulating, $380,000; transmission lines (repoling), $19,000; new substation (2,850 kva.), $47,000; substation reconstruction and additions, $174,000; new substation cottages and related structures, $14,000; automotive equipment (contingent upon ability to obtain), $69,000; miscellaneous small items, all classes, $216,300.

Installation of radiophone equipment, for which authority was received in 1943, will actually be made in 1944. The equipment to be installed will include two fixed stations and two mobile units and will be used in connection with the operation of a transmission line lacking other communication facilities. The expenditure will approximate $6,000.

Relative to the matter of deferred maintenance, our policy will be to undertake a comprehensive program of maintenance as soon as the release of materials and labor makes such an undertaking feasible. Mention might well be made here of the fact that, during the past two or three years, we have attempted to maintain a reasonable maintenance program. This is particularly true of generating equipment, which we have attempted to keep in a good state of repair even though such a program involved the rewinding of generators and the rebucketing of wheels. If the general condition of the equipment warranted it, the job was done if materials could be obtained.

One possible indirect benefit to the electric utilities that has resulted from

Western REA Systems

System	Borrower's Name	Cumulative Construction Allotments Nov. 30, 1943	1943 Construction Allotments	Consumers Connected 11/30/43
ARIZONA	**State Total**	**$ 1,283,000**	**$ 345,000**	**1,338**
2 S. E.	Stonewall Elec. Co., Tucson	100,000		226 (a)
4 Pinal	San Carlos Irrigation and Drainage District, Coolidge	145,000		305
14 Cochise	Sulphur Springs Valley Elec. Coop., Inc., Willcox	1,038,000	345,000	807
CALIFORNIA	**State Total**	**$ 2,457,500**	**$ 400,000**	**4,207**
1 Imperial	Imperial Irrigation District, Imperial	700,000		2,008 (a)
6 Modoc	Surprise Valley Electrification Corp., Alturas	788,500		983
16 Plumas	Plumas-Sierra Rural Elec. Coop., Portola	392,000		698
18 San Diego	Mountain Empire Elec. Coop., Inc., Campo	152,000		518
24 Bard D. P.	Bard Laguna Elec. Coop., Inc., Bard	25,000		(*)
27 Humboldt	Redwood Elec. Coop., Garberville	400,000	400,000	(*)
COLORADO	**State Total**	**$10,730,000**	**$1,743,000**	**14,898**
7 Mesa	Grand Valley Rural Power Lines, Inc., Grand Junction	423,000		1,059
14 Alamosa	San Luis Valley Rural Elec. Coop., Monte Vista	586,000		1,006
15 Morgan	Morgan Co. Rural Elec. Assn., Fort Morgan	840,000		1,088
16 Jefferson	Intermountain Rural Elec. Assn., Bailey	751,000	320,000	1,378
17 Prowers	Southeast Colorado Power Assn., La Junta	1,670,000	880,000	1,568
18 Gunnison	Gunnison Co. Elec. Assn., Inc., Crested Butte	335,000		388
20 Delta	Delta-Montrose Rural Power Lines Assn., Delta	578,000		1,179 (a)
21 S. E.	Stonewall Elec. Co., Trinidad	39,000		161 (a)
22 Boulder	Union Rural Elec. Assn., Inc., Brighton	410,000	10,000	1,093
25 Pueblo	San Isabel Elec. Assn., Inc., Pueblo	175,000	50,000	376
26 San Miguel	San Miguel Power Assn., Inc., Nucla	251,000	8,000	597
29 Phillips	High Line Elec. Assn., Holyoke	1,345,000 A		1,264
31 Larimer	Poudre Valley Rural Elec. Assn., Inc., Severance	581,000		1,424
32 La Plata	La Plata Elec. Assn., Inc., Ignacio	280,000		564
33 Dolores	Empire Elec. Assn., Inc., Dove Creek	615,000	280,000	276
34 Eagle	Holy Cross Elec. Assn., Inc., Basalt	470,000	195,000	259
35 Chaffee	Sangre De Cristo Elec. Assn., Inc., Salida	150,000		32
36 Routt	Yampa Valley Elec. Assn., Inc., Steamboat Springs	170,000		249
37 Douglas	Mountain View Elec. Assn., Inc., Colorado Springs	1,061,000		937
IDAHO	**State Total**	**$ 4,086,250**	**$ 120,000**	**6,600**
4 Bonner	Northern Idaho Rural Elec. Rehabilitation Assn., Inc., Sandpoint	880,750		1,080
10 Nez Perce	Clearwater Valley Light & Power Assn., Inc., Lewiston	1,458,000		2,483
11 Kootenai	Kootenai Co. Rural Elec. Assn., Inc., Coeur d'Alene	311,000		935
14 Valley	Long Valley Power Coop., Inc., Donnelly	341,000		251
15 Idaho	Idaho Co. Light & Power Coop. Assn., Inc., Grangeville	332,500		511
16 Cassia	Raft River Rural Elec. Coop., Inc., Malta	111,000		265
17 Fremont	Fall River Rural Elec. Coop., Inc., Ashton	340,000		697
19 Butte	Lost River Elec. Coop., Inc., Arco	214,000	120,000	230
21 Camas	Prairie Power Coop., Inc., Fairfield	98,000		148
MONTANA	**State Total**	**$ 3,637,298**	**$ 23,000**	**7,117**
1 Ravalli	Ravalli Co. Elec. Coop., Inc., Corvallis	180,700		440
2 Cascade	Sun River Elec. Coop., Inc., Fairfield	478,500		1,152
5 Richland	Lower Yellowstone Rural Elec. Assn., Inc., Sidney	176,600		508
9 Yellowstone	Yellowstone Valley Elec. Coop., Inc., Huntley	398,498	25,000	1,217
10 Madison	Vigilante Elec. Coop., Inc., Twin Bridges	485,000		620
12 Missoula	Missoula Elec. Coop., Inc., Missoula	247,000		407
13 Flathead	Flathead Elec. Coop., Inc., Kalispell	245,000		530
15 Fergus	Fergus Elec. Coop., Inc., Lewistown	378,000		544
16 Park	Park Elec. Coop., Inc., Livingston	233,000		272
17 Rosebud	Mid-Yellowstone Elec. Coop., Inc., Hysham	188,000		374
19 Stillwater	Beartooth Elec. Coop., Inc., Absarokee	292,000	8,000	579
21 Big Horn	Big Horn Co. Elec. Coop., Inc., Lodge Grass	208,000		474
24 Blaine	Big Flat Elec. Coop., Inc., Turner	45,000		(*)
25 Sheridan	Sheridan Co. Elec. Coop., Inc., Westby	37,000		(*)
26 Valley	Northern Elec. Coop., Inc., Opheim	45,000		(*)
NEVADA	**State Total**	**$ 244,000**		**424**
3 Alamo D. P.	Alamo Power Dist. No. 1, Alamo	27,000		(*)
4 Overton	Overton Power Dist. No. 5, Overton	217,000		424
NEW MEXICO	**State Total**	**$ 1,770,000**	**$ 411,000**	**3,119**
4 Eddy	Central Valley Elec. Coop., Inc., Artesia	341,000	41,000	505
8 Roosevelt	Roosevelt Co. Elec. Coop., Inc., Portales	267,000		625
9 Curry	Farmers Elec. Coop., Inc., Clovis	254,000		663
11 Taos	Kit Carson Elec. Coop., Taos	370,000	370,000	567 (a)
12 Otero	Otero Co. Elec. Coop., Inc., Cloudcroft	145,000		321
13 S. E.	Stonewall Elec. Co., Albuquerque	216,000		438
14 Mora	Mora-San Miguel Elec. Coop., Inc., Mora	177,000		(*)
OREGON	**State Total**	**$ 4,772,000**	**$ 28,000**	**7,096**
2 Lane	Blachly-Lane Co. Coop. Elec. Assn., Blachly	282,000		327
4 Lincoln	Benton-Lincoln Elec. Coop., Inc., Corvallis	1,035,000		1,198
5 Clatsop	Nehalem Valley Coop. Elec. Assn., Jewell	119,000		230
14 Umatilla	Umatilla Elec. Coop. Assn., Hermiston	293,000	10,000	773
16 Malheur	Malheur Coop. Elec. Assn., Vale	278,000		422
17 Douglas	West Douglas Elec. Coop., Inc., Roseburg	811,500		1,276

System	Borrower's Name	Cumulative Construction Allotments Nov. 30, 1943	1943 Construction Allotments	Consumers Connected 11/30/43
18 Eugene	Lane Co. Elec. Coop., Inc., Eugene	708,000		626
19 Jordan Valley	Jordan Valley Elec. Coop., Inc., Jordan Valley	30,000		84
21 Coos	Coos Elec. Coop., Inc., Coquille	450,500		853
22 Clackamas	Northeast Clackamas Co. Elec. Coop., Inc., Sandy	86,000		204
25 Deschutes	Central Elec. Coop., Inc., Redmond	331,000	10,000	655
26 Wasco	Wasco Elec. Coop., Inc., The Dalles	348,000	8,000	448
UTAH	**State Total**	**$ 1,269,000**	**$ 10,000**	**2,183**
6 Garfield	Garkane Power Assn., Inc., Hatch	576,000		1,045
8 Duchesne	Moon Lake Elec. Assn., Inc., Mt. Emmons	681,000	10,000	1,112
9 Beaver	Beaver Valley Elec. Assn., Beaver City	12,000		26 (a)
WASHINGTON	**State Total**	**$ 7,805,419**	**$ 232,000**	**12,321**
8 Benton	Benton Rural Elec. Assn., Prosser	382,500		1,011
9 San Juan	Orcas Power & Light Co., Eastsound	476,000		685
14 King	Mutual Power & Light Assn., North Bend	22,919		35 (a)
17 Klickitat	Public Utility Dist. No. 1 of Klickitat Co., White Salmon	550,000		250
18 Spokane	Inland Empire Rural Electrification, Inc., Spokane	2,010,000		3,419
20 Columbia	Columbia Co. Rural Electric Assn., Inc., Dayton	351,000	37,000	372
23 Grays Harbor	Quinault Light Co., Quinault	79,000		155
25 Cowlitz	Public Utility Dist. No. 1 of Cowlitz Co., Longview	221,000		670
27 Lewis	Public Utility Dist. No. 1, Chehalis	409,000		1,318
28 Kittitas	Public Utility Dist. No. 1 of Kittitas Co., Ellensburg	161,000		308
30 Stevens	Stevens Co. Elec. Coop., Inc., Colville	633,000	18,000	1,033
31 Chelan	Chelan Co. Elec. Coop., Inc., Leavenworth	66,000	8,000	105
32 Okanogan	Okanogan Co. Elec. Coop., Inc., Winthrop	170,000	5,000	327
35 Pend Oreille	Pend Oreille Elec. Coop., Inc., Newport	331,000	7,000	438
36 Adams	Big Bend Elec. Coop., Inc., Ritzville	432,000		322
37 Lincoln	Lincoln Elec. Coop., Inc., Davenport	622,000	4,000	588
39 Nespelem	Nespelem Valley Elec. Coop., Inc., Nespelem	106,000		300
42 Clallam	Public Utilities Dist. No. 1 of Clallam Co., Forks	183,000	183,000	358
45 Grant D. P.	Public Utility Dist. No. 2 of Grant Co., Ephrata	600,000		627
WYOMING	**State Total**	**$ 3,467,000**	**$ 69,500**	**4,795**
3 Fremont	Riverton Valley Elec. Assn., Inc., Riverton	261,000	10,000	519
5 Big Horn	Big Horn Rural Elec. Co., Basin	401,000		824
6 Goshen	Wyrulec Co., Lingle	457,000	50,000	902
9 Uinta	Bridger Valley Elec. Assn., Inc., Mountain View	172,000		346
10 Platte	Wheatland Rural Elec. Assn., Wheatland	80,000		203
11 Lincoln	Lower Valley Power & Light, Inc., Freedom	420,500	9,500	757
12 Park	Garland Light & Power Co., Powell	72,300		188
13 Washakie	Washakie Rural Elec. Co., Worland	56,500		147
14 Laramie	Rural Electric Co., Pine Bluffs	966,000 B		687
16 Hot Springs	Hot Springs Co. Rural Elec. Assn., Thermopolis	88,000		(*)
17 S. E.	Stonewall Elec. Co., Sheridan	78,700		126 (a)
21 Carbon	Carbon Power & Light Co., Saratoga	314,000		96
23 Shoshone	Shoshone River Power, Inc., Cody	100,000		(*)

(*) Not Energized.
(a) Estimated.
A—Includes $488,000 for line construction in Nebraska.
B—Includes $22,500 for line construction in Colorado and $555,500 for line construction in Nebraska.

REA Generating Plants

System	Location	Kw. Capacity	Type	Status
*Arizona 14 Cochise	Willcox and Benson, Cochise Co.	1,926	Nat'l Gas, D	Operating
*California 6 Modoc	Paisley and Alturas	85	Hydro	Operating
*Colorado 7 Mesa	Near Colbrann, Mesa Co.	120	Diesel	
*Colorado 16 Jefferson	Elizabeth	328	Diesel, Hydro	
*Colorado 26 San Miguel	Norwood	110	Diesel	
*Colorado 29 Phillips	Near Hayes Center, Neb.	10	Kohler, 140 Diesel	
*Colorado 32 LaPlata	Near Bayfield, Colo.	325	Diesel	
*Colorado 34 Eagle	Gypsum Creek, also Eagle	340	D and Hydro	Operating
*Colorado 37 Douglas	Limon, Colo.	416	Diesel	Operating
Colorado 18 Gunnison	Crested Butte, Gunnison Co.	500	Hydro	
*Idaho 14 Valley	Grimes Pass	275	Diesel	Operating
*Idaho 17 Fremont	West Yellowstone, Mont.	195	Diesel	Operating
Oregon 2 Lane	Blachly, Lane Co.	150	Hydro	Operating
*Oregon 26 Wasco	Near Maupin, Wasco Co.	400	Hydro	Operating
*New Mexico 11 Taos	Taos, N. M.	500	Diesel	Operating
*Utah 6 Garfield	Hatch and Torrey	790	D and H	Operating
Utah 8 Duchesne	Near Mt. Emmons, Duchesne Co.	900	Hydro	Operating
*Wash. 9 San Juan	Orcas Isl., Friday Harbor, Lopez Isl.	604	Diesel	Operating
*Wash. 17 Klickitat	Near Bickleton	7.5	Diesel	
Wash. 23 Grays Harbor	Quinault, Grays Harbor Co.	250	Hydro	Operating
*Wash. 42 Clallam	Forks, Wash.	300	Diesel	Operating
Wyoming 9 Uinta	Lyman, Uinta County	224	Nat'l Gas, D	Operating
Wyoming 11 Lincoln	Near Freedom, Lincoln Co.	600	Hydro	Operating
*Wyoming 14 Laramie	Pine Bluffs, Wyo.	72	Diesel	Operating
*Wyoming 21 Carbon	Saratoga, Wyo.	138	D, 377 Steam	Operating

(*—Acquisition)
In addition there are 25 mobile units, of which 5 are 120-kw. capacity and 20 are 100-kw. capacity.

the restrictions of the past two years has been the fact that most companies have found how to get the most out of equipment and facilities in the way of performance and loading. Some of these lessons cannot but be of lasting value and should be the cause of certain economies in both construction and operating practices.

In our opinion, the dumping of large war loads will necessarily cause some drop in the kilowatt-hour and revenue curves, but it is anticipated that this will be of relatively short duration if electrical merchandise and constructions materials are made immediately available at that time.—*H. R. Halpenny, chief engineer.*

Central Valley Project, USBR

CONSTRUCTION of Shasta Dam and power house progressed during 1943, and will continue throughout 1944, and the dam will be practically complete in 1944. Two 75,000-kva. units, No. 3 and No. 4, will be installed and in operation by July 1, 1944. Reservoir clearing was continued and fish-control works, relocation of railroads, highways and public utilities were completed. Work was continued on construction of Keswick Dam and powerhouse, on a restricted basis by order of the War Production Board. On the Friant division, the first 8-mile reach of the Madera Canal was completed. The 100-mile long Shasta-Oroville 230-kv. transmission line will be completed early in 1944. The remaining 28-mile section of the Madera Canal will be completed. Construction of the Friant-Kern Canal will be started if cleared by the War Production Board. Resumption of construction of the Contra Costa Canal, and the construction of a lateral system for the 26,000 acres of agricultural land under the canal is also dependent on action of the War Production Board. The 1944 appropriation is $35,104,000.

Coast Counties G. & E.

NO changes of consequence were made in generation or transmission during 1943.

Distribution—Additions for the year 1943 will amount to about $20,000, and consist largely of connections to existing lines. Replacements for the year will amount to about $55,000. Contemplated expenditures for 1944 will be in about the same amount.

Deferred transmission and distribution maintenance for the years 1942 and 1943 is estimated at $100,000.

Our policy and program on deferred maintenance as soon as materials and labor become available will be to proceed at an orderly rate to handle all of this work as soon as possible.

It is our opinion that there will be no substantial drop in load as far as our system is concerned when the war is completed, and that our territory will experience a substantial increase in domestic and commercial load within 12 to 18 months.—*A. E. Strong, general superintendent.*

Imperial Irrigation District

DURING 1943 very little expansion was made in the Imperial Irrigation District system. At the Hydro Plant No. 4 a tie was completed between the U. S. Bureau of Reclamation substation and the Drop No. 4 substation making available 15,000

kva. of power from Parker Dam.

About 15 miles of distribution line were built throughout the Imperial Valley to take care of feed mills, dairies and larger farms.

The deal for the sale of the California Electric Power Co.'s holdings in the Imperial and Coachella valleys was consummated and the district took over all the properties of the California Electric Power Co., except the ice plants, throughout the Imperial Valley, the Coachella Valley, and the Colorado River area on October 15, 1943.

A rather large program is planned for 1944 and 1945 by which the two systems are to be tied together and rebuilt so as to operate as one unit.

The district contemplates making both of its hydro plants automatic with centralized control in the load dispatcher's office. Deferred maintenance work, including $15,000 on the Diesel plant, will be prosecuted as conditions permit.

As to postwar outlook, if government bureaus keep hands off, normal conditions will soon return.—*E. H. Aiken, chief electrical engineer.*

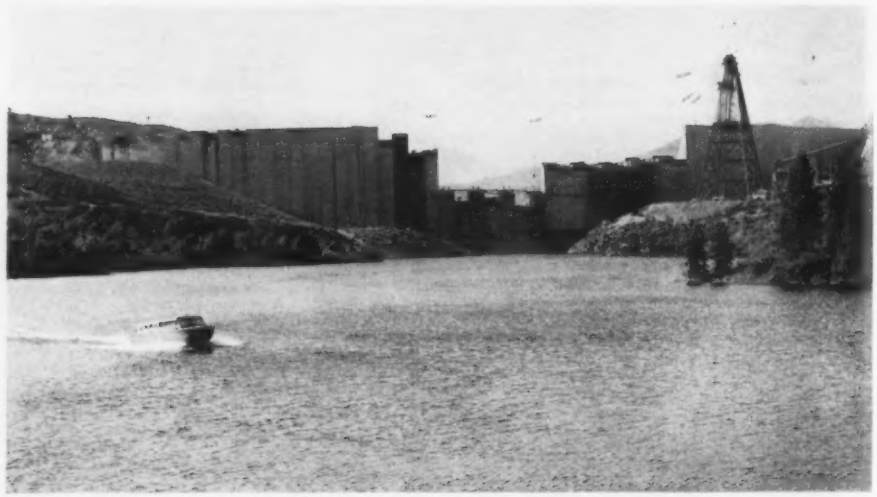
Los Angeles Bureau of P. & L.

CONSTRUCTION expenditures for extensions and new and improved facilities on the power system during 1943 amounted to approximately $10,100,000. Approximately half of this amount covered construction at the new Harbor steam plant, the first unit of which was placed in service in June 1943. The 1944 program will be limited largely to completion of present projects and the necessary additions, betterments and extensions to the system. The estimated expenditures will be approximately $5,032,000.

There was no change in hydro generating capacity during the year. Steam generating capacity, however, was materially increased by the placing in service in June 1943 of the first unit at the new Harbor steam plant, with a capacity of 65,000 kw. Construction work in connection with the installation of additional units projected at this station is in abeyance until such time as the necessary materials and equipment may be obtained.

New transmission facilities placed in service in 1943 included 2.4 miles of 132-kv. underground cable between Harbor steam plant and Receiving Station "C"; 5 miles of 132-kv. underground cable and 7 miles of double circuit overhead transmission between Receiving Station "D", located in the West Los Angeles area, and Receiving Station "E" in the San Fernando Valley.

The necessity of recovering copper for the war effort, and removal of lines no longer needed resulted in a net decrease of 32 circuit miles in the overhead distribution system, while the underground system showed a gain of 2 miles of 34.5 kv. and 19 miles of primary and secondary cable. Contemplated additions to the distribution system for 1944 include 60 circuit miles of overhead primary and secondary distribution necessitated by an expanded housing program for essential war workers, and 20 miles of primary and secondary underground cable.



Storing of water back of Shasta Dam on California's Central Valley Project was started Jan. 1, 1944, and a sizable lake is forming. The reservoir will impound 4,500,000 acre-ft. of water for power, irrigation and flood control

Receiving Station "D", with a present capacity of 150,000 kva., was placed in service in February 1943. This station is of practically standard construction, the major portion of the equipment used having been purchased or delivered before restrictions due to the war effort were imposed. In addition to relieving the overloaded condition at Receiving Stations "A" and "B", improved voltage regulation and efficiencies in system operation will result, due to shortening of subtransmission circuits. There was no material change in distribution station capacity during the year; however, capacity additions at industrial and commercial stations, which are major stations located on the consumer's premises, together with several new stations, resulted in a net increase of 66,000 kva.

Various types of relay protection on lines and equipment were provided during the year. The principal installations provided differential protection on one 65,000-kw. steam generating unit, pilot wire relays on two 132-kv. combination overhead and underground circuits, one 132-kv. underground circuit and seven 34.5-kv. overhead and underground circuits, and differential protection with harmonic restraint on three 132-kv. transformer banks. During 1944 it is planned to provide carrier current equipment and relays to protect two 132-kv. overhead circuits; transformer differential relays with harmonic restraint on two 50,000-kva. transformer banks connected as a unit; and miscellaneous installations of overcurrent relays on transformer banks at industrial stations.

Approximately five miles of communication cable was installed to provide additional communication and control circuits. Twenty-five telephone call boxes were provided for trouble-men operating in remote areas. Manual type telephone switchboards were installed at the Harbor steam plant and one receiving station, in addition to a 100-line automatic telephone system for intercommunication at the Harbor plant. The 1944 program calls for the installation of a special power line carrier phone station at a remote location on the Boulder transmission line to provide communication facilities from that point to both the system load dispatcher and the Boulder power plant.

A considerable amount of deferred maintenance has resulted from restrictions imposed by the war effort. A substantial reserve is being set up to cover the cost of this work and, as soon as the necessary materials and labor are again available, deferred maintenance will be progressed according to a program which, generally speaking, would require from three to five years. This depends, of course, on many unknown factors such as the possibility of a concentrated effort being made to provide ample employment during the postwar period for men returning from military service.

During 1943 energy produced for the power system was approximately

3,300 million kwh., representing an increase of 38% over the year 1942. It is estimated that the energy requirements for 1944 will be approximately 3,800 million kwh.—*R. R. Robertson, chief electrical engineer and deputy general manager.*

Pacific Gas and Electric

THE first half of the year 1943 witnessed the completion of Dutch Flat power house and Oleum No. 2 steam plant, and the rehabilitation and restoration to service of Bakersfield steam plant, idle since 1931, making available to the system an additional 92,500 kva. of generating capacity as follows:

Dutch Flat: one unit at 27,500 kva.—hydro
Oleum No. 2: one unit at 50,000 kva.—steam
Bakersfield: one unit at 12,500 kva.; two units at 6,750 kva.—steam

System peak capacity was further improved by the completion of an enlarged forebay at Hat Creek No. 2 hydro plant, where increased storage will yield approximately 6,000 kw. of dry year capacity.

Principal emphasis on generating plant construction during the latter half of the year related to the Pit No. 5 project, which will be completed before the summer of 1944 and will provide 160,000 kva. of capacity in four units of 40,000 kva. each.

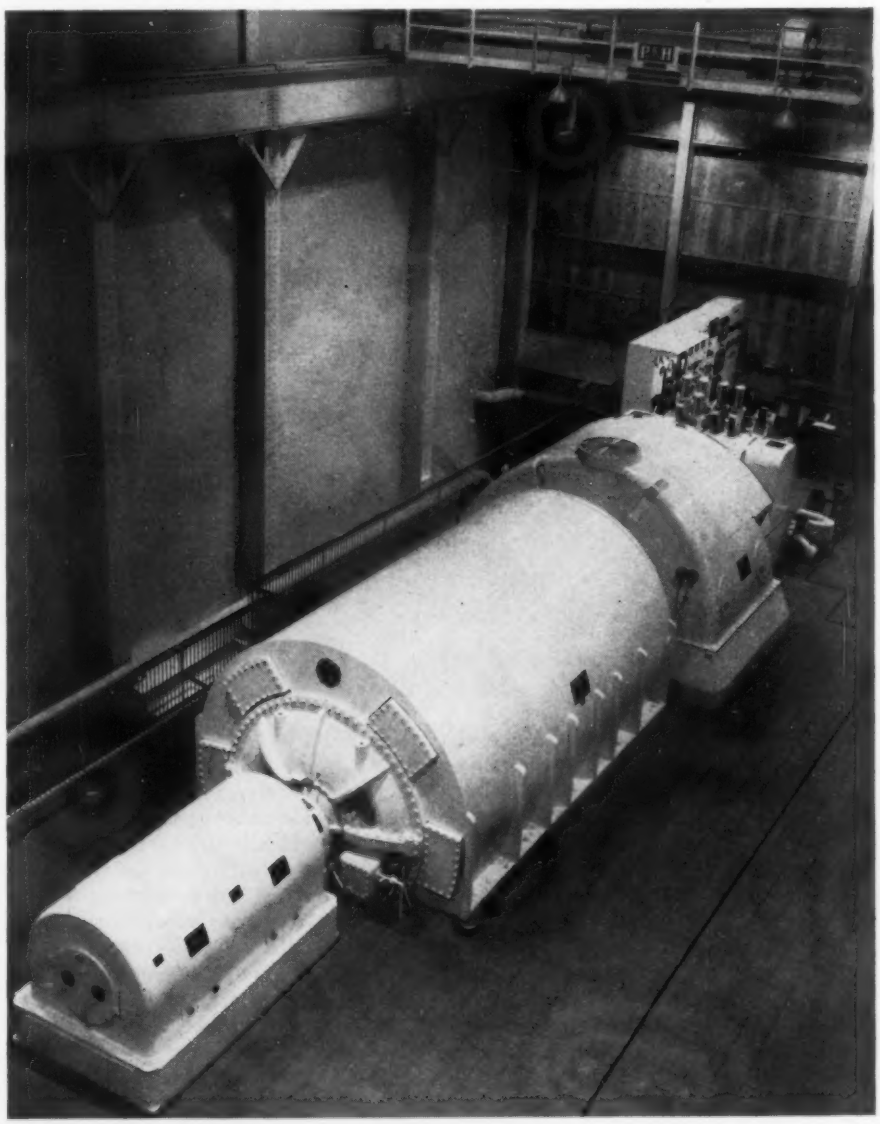
This construction marks the close of the company's current long-term construction program inaugurated in 1937, which will have added a total of 453,000 kva. of new generating capacity to the system. It has provided adequately for the accelerated load growth experienced as a result of war activities in this area and has left a safe margin of reserve to insure continuity of service. Development of this program has been coordinated with plans of the Bureau of Reclamation for Shasta Dam power and has given full consideration to its absorption into the Northern California territory served by Pacific Gas and Electric Co. The company has planned no further hydro or steam generating plants for the year 1944.

Transmission—To deliver energy from Dutch Flat, Oleum and Pit No. 5 power houses, 125.8 miles of single-circuit 110-kv. line were completed and placed in service during 1943 and 14.2 miles of 220-kv. double-circuit line were completed, though not yet operative. In addition some 33 miles of 60-kv. single-circuit line were completed to serve specific loads arising from military demands and industrial activities, and to improve flexibility of the 60-kv. transmission system. Approximately seven miles of new 60-kv. single circuit were installed by reason of the flooding of Shasta reservoir area. These several transmission improvements are summarized in the table.

The initial block of power from Shasta Dam will become available in the spring of 1944 with completion of the first two 75,000-kva. generating units. Their output will be distributed by Pacific Gas and Electric Co. under contract with the United States Department of the Interior. This additional power supply, in conjunction with that to be received from Pit No. 5 plant, requires substantial additions to the company's high-voltage transmission facilities involving an expenditure upwards of $6,000,000 for new lines, switching, transformer and synchronous condenser installations. Work on this project was commenced in the late fall of 1943 and the major part of it will be completed during the first half of 1944. The substation construction required is discussed under a subsequent heading. Transmission line improvements necessary for this project, and the 110-kv. and 60-kv. construction planned for 1944 are shown in the table.

Distribution—Additions and betterments to the company's distribution facilities during 1943 were again dictated almost solely by demands emanating from war activities. These demands required the installation of some 250 miles of distribution lines. The necessity of conserving critical materials and utilizing existing distribution facilities to the maximum limited the rebuilding and modernization of distribution plant to that absolutely necessary to supply increases in load or to replace worn out equipment. The total amount expended for rebuilding during the year was approximately $4,000,000.

Installation of static capacitors was limited to 270 kva. during the past year. During the four years preceding this, however, a total of 45,000 kva. of capacitors has been added.



Generating capacity of the San Diego Gas & Electric system was increased 35,000 kw. by addition of this 3,600-rpm. turbo-generator during past year

PG and E Transmission Lines Completed During 1943

Location	Distance	Voltage	Conductor	Function
Pit 5 to Round Mountain	14.2 miles double circuit	220 kv.	380.5 MCM copper	Tie from Pit No. 5 to Pit No. 1 and Pit. No. 3 PH circuits.
Dutch Flat to Vaca Dixon	98.0 miles single circuit	110 kv.	3/0 copper	Delivers power from Dutch Flat and provides flexibility in transmission of power from Drum PH.
Vaca Dixon to Cordelia	18.3 miles single circuit	110 kv.	2/0 copper	Supplies increased war loads in North Bay area and releases other lines for transmission of Pit power to Bay area.
Oleum to Martinez	9.5 miles single circuit	110 kv.	250 MCM copper	Tie between steam plants; also provides additional path for Pit power to San Francisco Bay area.
Robla to Brighton Junction	8.85 miles single circuit	60 kv.	1/0 copper	Tie between two of company's 60-kv. systems for necessary interchange of power.
Herdlyn-Newark to Santa Rita	8.44 miles single circuit	60 kv.	No. 4 copper	Serves new load at military camp.
Harrison St., Stockton to Terminous Jct.	15.3 miles single circuit	60 kv.	No. 4 copper	Tie between existing 60-kv. lines for improved service and better flexibility of delivery.
Contra Costa-Shell Chemical to Columbia Steel	0.5 miles single circuit	60 kv.	No. 2 copper	Serves additional load at Columbia Steel Co.
Stillwater Jct. to Keswick	6.95 miles single circuit	60 kv.	1/0 copper	Necessary for rerouting Delta-Kennet Keswick 60-kv. line to avoid Shasta reservoir.

Shasta and Pit No. 5 Transmission

Location	Distance	Voltage	Conductor	Construction Required
Vaca-Dixon to Contra Costa to Mocho Jct.	53.3 miles single circuit to Contra Costa, thence double circuit to Mocho Jct.	Increase one circuit from 110 kv. to 220 kv.	500 MCM copper and 795 MCM A.C.S.R.	None except for replacement of A.C.S.R. conductor on Sacramento-San Joaquin River crossing.
Mocho Jct. to Newark	18.25 miles single circuit	220 kv.	795 MCM A.C.S.R.	New line on double circuit towers.
Bucks Creek to Wilson	201.6 miles single circuit	Increase from 165 kv. to 220 kv.	795 MCM A.C.S.R	None; 220-kv. construction now operating at 165 kv.
Wilson to Herndon	42 miles double circuit	Increase one circuit from 110 kv. to 220 kv.	795 MCM A.C.S.R.	Reinsulation for 220-kv. operation.

Other Transmission Improvements

Location	Distance	Voltage	Conductor	Function
Hat Creek No. 2 to Burney	8.35 miles single circuit	60 kv.	No. 4 copper	Improves service and increases power supply to Burney area.
Martinez to Oleum Jct.	9.5 miles single circuit on existing towers	110 kv.	250 MCM copper	Second tie between steam plants; also provides additional path for hydropower to East Bay area.
Contra Costa to Columbia Steel Jct.	5.3 miles single circuit on existing steel poles	60 kv.	250 MCM copper	Improves reliability of service to defense loads in Pittsburg area and provides for expected increase in demand from Columbia Steel Co.

Distribution additions contemplated for 1944 are expected to be of the same general character as those completed during the past year and will involve an expenditure of about $5,000,000.

Substations — The net increase in distribution substation transformer capacity during 1943 is 58,100 kva. A total of 25,200 kva. of static capacitors was installed at a substation serving a large industrial consumer. In addition to these distribution facilities, extensions to six major transmission substations will be completed in 1944 to receive power from Pit No. 5 plant and from the first two generating units at Shasta Dam. These will add 271,500 kva. of transformer capacity and 140,000 kva. of synchronous condensers at Newark substation, 90,000 kva. of transformer capacity at Contra Costa and 50,000 kva. of synchronous condensers at Herndon substation. Additions to switching and control equipment will be made at Shasta, Bellota and Wilson substations.

Relaying — No major installations were made in the relay system during 1943. However, to improve reliability of operation in the 220-kv. transmission system for the advent of Pit No. 5 and Shasta power, new high-speed protective relay equipment will be installed during 1944 at many points. This will include two carrier terminals on the 53-mile section of the 220-kv. line between Contra Costa and Newark substations. Other high speed relay installations will be designed for future applications.

Existing protection on 110-kv. circuits will be speeded up by the use of various instantaneous relay combinations and certain bus protection schemes. These installations will be a

part of a coordinated program of high-speed protection for the company's transmission system.

Communications — A second telephone circuit was installed from Pit No. 1 power house to Redding to serve the plants on the Pit River and a carrier frequency telephone circuit, connected to the telephone line from Redding to Oakland, is now being installed to augment this service. A carrier telephone circuit was also installed on a wire telephone circuit from Fresno to Bakersfield with a wire line extension from Bakersfield to Magunden substation (Edison), augmenting communications to the southern part of the company's system and providing for the dispatching of power between this company and the Southern California Edison Co.

A new telephone circuit was installed on the new 60-kv. line from Delta to Keswick to replace the line to be removed in this area on account of the flooding of Shasta reservoir area. This circuit is used for dispatching the interchange of power between this company and the California-Oregon Power Co.

Cordless switchboards were installed at Shasta, Cordelia and Vaca-Dixon substations.

During 1944, in order to provide the additional communication required for the operation of the Pit No. 5 and Shasta developments, carrier frequency telephone circuits will be installed on the 220-kv. lines between Pit No. 5 power house, Shasta substation, Contra Costa substation, Oakland (Station X), and Bellota substation, and on the telephone lines between Bellota and Oakland (Station J). This will be used in conjunction with the channel which the Bureau of Reclamation will install on the Shasta Dam-Shasta substation 220-kv. line.

The communication to the North Bay division will be improved by the installation of a carrier telephone channel on the telephone lines between Oakland and San Rafael.

Deferred Maintenance — Due to the heavy demands imposed upon our system by war industries and the importance of adequate and reliable service, it has been necessary to maintain our facilities in the best possible operating condition during the war period. It has therefore not been possible to defer maintenance to any appreciable extent.

Trends—One significant trend in the electrical industry which is an outgrowth of the war is the attention to standardization and simplification of products and equipment which has been impelled by the shortage of critical materials and manpower. Emphasis on standardization will no doubt continue in the postwar period due to the urgent need of reducing costs in the face of inflationary influences. This should have an important and beneficial effect on future utility construction.

Postwar Construction — As distinguished from the situation applying to some Eastern utilities, a substantial part of Pacific Gas and Electric's war load is the result of the heavy shipbuilding and metal reduction activities, much of which will be curtailed on conclusion of the war. Because of the interval of time to be expected between the close of hostilities in the European theater and in the Pacific, dumping of such war loads may extend over a period of a year or two in this area. While some time will be required to replace these loads, indications are that it may be necessary to commence construction of additional generating facilities within the territory served by the company in from one to two years after the Pacific war has ended.—*I. C. Steele, chief engineer.*

Parker Dam, USBR

TWO 30,000-kva. generating units in December 1942, a third duplicate unit in January 1943, and a fourth duplicate unit in May 1943, were placed in operation at Parker power plant. The 125-mile Phoenix-Tucson transmission line was placed in temporary operation at 69 kv. in 1942, and in permanent operation at 115 kv. in May 1943. At the same time a 154/115-kv., 45,000-kva. transformer bank to supply the Phoenix-Tucson line was placed in operation at Phoenix substation. The Parker-Gila 115-mile 154-kv. line and the Gila substation near Yuma were placed in operation in August 1943. Following this a 49-mile 154-kv. line from Gila substation to Imperial Irrigation District system in Imperial Valley was placed in operation, and a local 33-kv. line, from Gila substation connected the local Yuma system with the Parker power system. Earlier in the year, a 65-mile 69-kv. line was placed in operation between Parker Dam and Bagdad.

When Parker power plant went into operation, the Parker Dam power project became a completely integrated power system extending in two main directions, one from Parker Dam to Phoenix and Tucson, approximately 260 transmission line miles distant, and the other south from Parker Dam to the Gila substation near Yuma about 125 miles distant. The system ties through the Metropolitan Water District to Boulder power plant on the north; to the Central Arizona Light and Power Co., and the Salt River Valley Water Users Assn. at Phoenix; the Tucson Gas, Electric Light and Power Co. at Tucson; and the California Electric Co.; and the Imperial Irrigation District through the Gila substation near Yuma. The system has already been of great value in the war program, making possible the supplying of the increased loads in the territory and substituting hydro energy for fuel generated energy with resulting conservation of fuel.

City of Pasadena

GENERATION remains the same as it has during the past year and we do not anticipate any increase in this division. The recommendations for 1945 must necessarily await conditions which may materially change our present set-up. However, for the present, there is no need for additional capacity.

There were no changes in transmission.

We have replaced many of the distribution lines which became out of order and will more than likely proceed with the same policy during the coming year in order to supply work for the crews which must be maintained to meet emergencies.

Substations will remain the same with the exception of the additional capacity required for the Cal-Tech wind tunnel which is being supplied by the agencies interested.

Deferred Maintenance—We have some maintenance which may be required on steam turbines when they are released from the power coordinating committee according to schedules which are necessary to take out these units in order that we may not cripple the production of energy through other cities or community programs. This cost may run into $8,000 or $10,000.

It has always been our policy to keep the equipment in the best of repair and when needed equipment is available we will proceed to replace any part of our system and place it in good working order. This policy is necessary to render Class "A" service.

War conditions have not made many important changes in our business.

It is our opinion that the Pacific Coast will be regulated in the matter of postwar recovery entirely by what may occur in the European theater. If Germany is deleted from the war program, then it would follow that the Japanese situation may be extended for some time after the European situation has been cleaned up. This being the case, the Atlantic and eastern states will have an opportunity to retool and proceed with their industries supplying the needs for the nation ahead of the Pacific Coast area. Undoubtedly the tendency of the Army and Navy will be to further increase the production of war materials, shipping and so forth on the Pacific Coast,

possibly to a greater degree than they are now doing. This being the case, the question will be answered by how and when the war ends.—*B. F. DeLanty, general manager.*

Riverside Electric Dept.

The year of 1943 has passed with the result of an almost unbelievable minimum of capital additions, having carried on with only maintenance and repair work. Additional capacitors to the extent of 500 kva. were added to our distribution lines for power factor correction, this having been our only capital investment of any consequence.

Power purchases during the year reached approximately 40,000,000 kwh., being a year with the largest gain in the history of this department.

Considerable time has been devoted to the more definite planning for construction to be carried on in the nature of postwar improvements.—*L. W. Grayson, superintendent.*

San Diego Gas & Electric

DURING the year 1943 the construction program of the San Diego Gas & Electric Co. was largely entailed in serving additional military establishments, war industries and federal housing projects for war workers. Company expenditures for new and improved facilities totaled $984,000. The company's budget for 1944 contemplates the expenditure of $745,000.

The only change in the company's generating capacity during the past year was the completion in February of Silver Gate Unit No. 1, rated at 35,000 kw. This 850-psi, 900° machine has operated very satisfactorily and has carried up to 20% overload for extensive periods. No additional generating capacity is contemplated for 1944 or 1945.

The only addition to the transmission system was an extension of 9.3 miles of 66-kv. line to furnish service to a military camp. During 1944 we expect to make a 20-mile, 66-kv. extension from Oceanside to Escondido in order to increase the capacity in the former community. Twenty-two miles of distribution lines were constructed during the past year, and approximately the same amount is contemplated for 1944.

A total of 5,000 kva. of substation capacity was installed during the year, and 720 kva. of static capacitors were added, bringing the system total to 25,110 kva.

The company's mobile radio system, providing two-way communication between the load dispatcher and field crews, was extended during the year and further additions are expected in 1944, should apparatus be available.

Deferred maintenance has not yet become a serious problem, although shortages of some materials have naturally led to postponement of certain improvements. It will be the company's policy after the war to correct any such deficiencies as rapidly as men and materials may be had.

We believe that various expedients made necessary by war conditions have shown the way to economies in operation, and likewise modifications in construction methods, without the sacrifice of either safety or continuity of service. Obviously, it is to be expected that these methods will be continued after the war. It is also to be hoped that new uses of metals, alloys and plastics, developed under the pressure of war conditions, will make further improvements and economies possible.

Since both war industries and military establishments in this community have had a very considerable effect upon its growth and development, we naturally visualize some serious postwar problems and, for a while, some loss of load. The nature of our situation is such that we may expect considerable military and naval activity in this vicinity after the European phase of the war is terminated; and, even after the end of the Asiatic phase, it is presumed that troop and materiel movements through the port will continue after much of the rest of the country has returned to a peacetime basis.—*L. M. Klauber, vice-president and general manager.*

Southern California Edison

IN the year just past we spent approximately $8,500,000 for additions to plant and improvement to our existing facilities. Our construction budget for 1944 calls for an expenditure of approximately $4,500,000.

In January 1943 the new A-5 unit at Boulder power plant came into service, adding 82,500 kw. generating capacity to our system. On test this unit carried full load satisfactorily at both 50 and 60 cycles.

Due to the requisitioning by the government of two steam turbo-generating units at Long Beach steam plant, the company rushed to completion the installation of a new 82,000-kw. unit which went into service in November, and has been doing its share in carrying the war loads in this area ever since. The new unit was placed in service ten months after the first unit was requisitioned by the government. This was made possible by the cooperation of the WPB in making available to the company a unit on which much preliminary work had been done. The new unit was originally designed for 60-cycle operation but was converted to 50-cycle for use on our system, and on acceptance tests carried full load at 50 cycles and also 60 cycles.

In the early part of this year we completed the installation of new runners in the Big Creek plants. After these changes were made it was possible to carry 37,000 kw. more at 60 cycles on the five units involved than with the old runners.

For the last three years our steam plants have carried an average of 3% of the total system load. In 1943 this percentage moved up to approximately 15% and it appears that it will be this high in 1944 with the same type of water year as 1943, and still higher if 1944 should be a dry year. This greater use of steam plants has necessitated additional maintenance work. Rebuilding of all the superheater tubes in Long Beach No. 3 boiler plant is under way and this, together with modernization work on the boilers, will be completed this spring to fit this plant for higher load factor operation in 1944 than it has experienced in the past.

No new hydro or steam generating capacity will be added directly to the Edison system in 1944.

The installation of the new N-7 generator at Boulder power plant will have the effect of adding 82,500 kw. of additional generating capacity to the area but will not materially increase the kilowatt-hours available.

No major additions were made to the transmission system as the 220,000-volt transmission plan was completed last year.

Approximately 100 miles of distribution lines were added to the system last year, and 16,000 new customers were connected to the distribution system.

During 1943, 75,000 kw. of transformer capacity were added to the major 220-kv. system; 76,000 kw. of capacity to the 66-kv. transmission system; and 15,000 kw. of capacity added to distribution substations.

Most of the new domestic customers are of the "defense housing" class and practically all of the power load added was for the war effort. A large part of this load has been added in the existing industrial area requiring a minimum of line extension but has had the effect of loading up the major and transmission subs in this area. It is difficult to determine at this time how much of this load will be converted to peacetime needs and remain in this area and how much abandoned. This conversion and relocation will constitute one of the major problems after the war. Not many additions have been made to the regular distribution system due to the discontinuance of the manufacture of domestic appliances

during the last two years. At the end of the war and expected return to normal times there will be a large increase in the commercial and domestic demands in the smaller cities and towns, which will necessitate considerable reinforcement of distribution substations and lines.

Telemeter equipment has been installed in our dispatcher's office to indicate power flow between the 50- and 60-cycle systems in this area. This has been very helpful in the interchange of power. Plans are under way and will probably be carried out in 1944 to interconnect the new steam unit at Long Beach with receiving Substation C of the Bureau of Power and Light at 60 cycles. This will release the 60,000-kw. frequency changer from direct connection with one of the units at Long Beach, and will make possible the further interchange of power between the two systems.

Additions have been made to the carrier current telephone system using the 220-kv. transmission lines as channels and additional connections have been made between the various utilities in the Pacific southwest area so as to facilitate the interchange and dispatching of power between one system and another.

During the war period the scarcity of critical material has made it difficult to get anything but essential items. This means that some maintenance has accumulated which it will be necessary to take care of after the war when materials and manpower can be diverted to this use. This may be very helpful in filling in the lag, such as has occurred in the past following similar circumstances.

Many substitutions have had to be made in material and equipment during the last two years and some new ideas have been developed which may simplify cost and construction in the future. On the other hand much substitute material has had to be installed which has a much shorter life than that previously used and will have to be replaced in the not too distant future.

The heavy demands on the oil reserves in this area may have a decided effect on the future power development in this territory as the scarcity and increasing price of fuel may make hydro developments more attractive than steam plants.

As far as the West Coast is concerned, this will be just another swing in the pendulum which has marked the improvement and development of generating sources.—*N. B. Hinson, executive engineer.*

Turlock Irrigation District

ELECTRIC construction during 1943 was limited to building lines only to farms producing food for the war program and to installing power services to food and defense industries in this area.

Some maintenance work was done and capacitor banks installed on rural distribution lines.

Deferred maintenance will be undertaken as soon as materials and labor are available.—*L. H. Parker, electrical engineer.*

Colorado

Colorado-Big Thompson, USBR

The Green Mountain Dam and power plant were completed in May 1943, bringing into service the first main feature of the project. The power plant contains two 12,000-kva. generating units. The Granby Dam diversion tunnel was completed. Excavation of the Continental Divide tunnel was continued and should be completed about the middle of 1944, and concrete lining will be started. Contract for the construction of Shadow Mountain Dam and dikes was awarded and work will be started early in 1944. Current appropriation is $4,508,000.

Current and Future Power Development on Bureau of Reclamation Projects

Name of Project	State	River	Purpose (1)	Name of Plant	Year Initial Operation	Initial Capacity Kw.	Initial Capacity Units	Ultimate Capacity Kw.	Ultimate Capacity Units
Boise	Idaho	S. Fork Boise	F.C., Irr., P.	Anderson Ranch	(2)	27,000	2 (3)	40,500	3 (4)
Boulder Canyon	Ariz.-Nev.	Colorado	F.C., Irr., P.	Boulder	1936	(5) 952,300	14 (6)	1,322,300	19 (7)
Central Valley	California	Sacramento	F.C., Irr., P.	Shasta	1944	154,000	4 (8)	379,000	7 (9)
Central Valley	California	Sacramento	F.C., Irr., P.	Keswick	(2)	75,000	3 (10)	75,000	3 (10)
Colorado-Big Thompson	Colorado	Blue	Irr., P.	Green Mountain	1943	21,600	2 (11)	21,600	2 (11)
Colorado-Big Thompson	Colorado	Big Thompson	Irr., P.	1, 1A, 2, 3, 4 and 4A	(2)	(2)	(2)	160,000	(12)
Columbia Basin	Washington	Columbia	F.C., Irr., P.	Grand Coulee	1941	(5) 494,000	7 (13)	1,974,000	21 (14)
Davis Dam	Ariz.-Nev.	Colorado	F.C., Irr., P.	Davis	(2)	180,000	4 (15)	225,000	5 (16)
Fort Peck (17)	Montana	Missouri	F.C., Irr., N.P.	Fort Peck	1943	35,000	1	105,000	3 (18)
Parker Dam	Ariz.-Calif.	Colorado	Irr., P.	Parker	1942	60,000	3 (19)	(5) 120,000	4 (20)

(1) F.C.=Flood Control; Irr.=Irrigation; N.=Navigation; P.=Power.
(2) Construction stopped for period of war. Initial operation date indefinite.
(3) 2—13,500 kw.
(4) 3—13,500 kw.
(5) As of June 30, 1943.
(6) 11—82,500 kw., 1—40,000 kw., 2—2,400 kw.
(7) 15—82,500 kw., 2—40,000 kw., 2—2,400 kw.
(8) 2—75,000 kw., 2—2,000 kw.
(9) 5—75,000 kw., 2—2,000 kw.
(10) 3—25,000 kw.
(11) 2—10,600 kw.
(12) 6 plants.
(13) 3—108,000 kw., 2—75,000 kw., 2—10,000 kw.
(14) 18—108,000 kw., 3—10,000 kw.
(15) 4—45,000 kw.
(16) 5—45,000 kw.
(17) Fort Peck power plant operated by U. S. Army Engineers. Power distributed by Bureau of Reclamation.
(18) 3—35,000 kw.
(19) 3—30,000 kw.
(20) 4—30,000 kw.

Colorado Springs

OF $300,000 budgeted for 1943, only $80,000 was spent for capital improvements. The work done consisted of additional condensate pumps at the steam plant to permit 20% overloads on the turbines; about seven miles of 13.8-kv. line with 2,500-kva. transformer and switching equipment to interconnect with the industrial power plant of the Golden Cycle Corp.; 750 kva. additional substation facilities for supplying Army installations, and miscellaneous additions to the distribution system.

A total of $330,000 is budgeted for 1944 to cover ordinary additions as well as items contingent on the release of materials by WPB including a new 5,000-kw. turbo-generator with water

cooling capacity and additional forebay capacity for the hydro plant.

We have set up a fund for deferred maintenance amounting to about 4% of our gross revenue to use when materials and labor become available.

We expect to carry on our normal construction program as soon as equipment is available, as our war loads are now being carried by our reserves. Dumping of war loads will merely make this capacity again available as reserve.

Incidentally, our 1943 gross generation is 160% of that for 1941.—*F. H. Wiley, superintendent electric division.*

Colorado Central Power

OUR company probably will do a minimum amount of construction in 1944. We have no generating facilities and our construction will be only for small rural extensions and the connection of additional customers which are estimated at this time to run in the neighborhood of $30,000.—*C. C. Baker, vice-president, general manager.*

Public Service of Colorado

ELECTRIC department construction for 1943 approximated $700,000, 42% of which was spent for distribution plant. Production plant accounted for approximately 32% of the total, with the remaining 26% allocated to transmission and general plant expenditures. Proposed plant expenditures for 1944 amount to approximately $850,000, 50% of which will go to distribution, 39% to plant production, with the remaining 11% largely to transmission.

The company completed its major capacity expansion program just prior to our entry into the war and it is, therefore, anticipated that future capital outlays within the duration of the war and immediately thereafter will be devoted almost entirely to reinforcing transmission outlets and delivering existing capacity to war industries now being served and new peacetime capacities which will develop thereafter.

Generation—During 1943 system installed capacity was increased by 12,500 kw. due to the rebuilding of the 20,000-kw. unit in the Valmont steam plant, increasing that unit to 32,500 kw., and increasing the total installed (name-plate) capacity of this plant from 95,000 kw. to 107,500 kw. An additional 20,000 kw. of hydro capacity was made available through a contract with the United States Bureau of Reclamation for power generated by the Green Mountain plant of the Colorado-Big Thompson Project. This latter plant was placed in operation in May 1943.

At the present time, there is no new capacity under construction of either hydro or steam, nor is there any new capacity scheduled for 1944 or 1945. Likewise, no specific rehabilitations are scheduled for either of these periods.

Transmission—Construction of a new 30-mile, 110 kv. wood pole H-frame transmission line of 37,000 kva. capacity, begun in 1942, was completed and placed in operation in January-February of 1943. This line extends from the Valmont steam plant to Denver and to a new high-voltage substation constructed by the Army Engineers for service to the Rocky Mountain arsenal. There was no reconductoring, re-insulating or other significant improvement to transmission during 1943. Aside from a rebuild of the Leadville double circuit entailing a possible expenditure of $16,000-$20,000, no significant improvements are contemplated for 1944. If materials should become available some reconductoring possibly would be done in 1945, though no specific plans have been developed as of the present time.

Distribution—Eleven miles of new distribution line were constructed in 1943, with no material increases scheduled for 1944, due primarily to the scarcity of materials and the restrictions on expansion, which are yet in effect. The installation of a Peterson coil on the Denver 13-kv. system and the installation of a 7,500 kv. transformer in the Capital Hill substation in Denver, together approximating an expenditure of $50,000, are contemplated for 1944. It is expected that if the material situation eases sufficiently that the development of a new 20,000-kva. 110/13-kv. substation in South Denver will be undertaken in 1945, with possibly some part of the low-voltage switching equipment and related distribution feeders being installed in 1944. The probable necessity for this work, which will approximate one-quarter million dollars, has arisen so recently that no part of the possible expenditure has been budgeted. In addition, rebuilds together with replacement of breakers, switchgear and other essential protection devices to the extent of $85,000 to $90,000 is anticipated for 1944.

Substations—Substation capacities were increased during 1943, by approximately 27,600 kva. The North substation was increased by 20,000 kva., which increase was primarily for the purpose of service to war loads. In addition, the transmission substation capacity at Valmont plant was increased 7,500 kva. because of the increased plant capacity at Valmont plant, the construction of the Valmont plant-North sub-transmission line and other attendant operating problems.

There were no major relaying, communications, tie-line load controls or load frequency control installations during 1943, nor are there any major installations of this character contemplated for 1944.

Deferred Maintenance—The company has maintained its system in a fairly high degree of operating efficiency and does not consider it has any considerable amount of deferred maintenance which will necessitate an extensive rehabilitation program when materials and labor conditions have improved. Total maintenance for 1943 and estimated maintenance for 1944 show a substantial increase over the years 1940 and 1941, with no material additions in system values aside from purely normal additions.

Economic Trends—Completion of several major war loads in the area served by this company has tended to industrialize the system's former domestic-agricultural load curve and, because the hydro capacity of the region is typically peak-hitting in character, has greatly increased the load factor on our steam plants. The anticipated decrease for commercial lighting load for 1943 did not materialize but, on the contrary, resulted in an increase over the previous period of approximately 5.5%. The domestic classification showed an increase of 6.6%, industrial power 4.2% and an over-all company increase in the electric revenues of approximately 8% over 1942.

With respect to war loads, it is our opinion that it will take approximately three years, based on the prewar growth of approximately 8,000 kw. per year, to recover the amount of load necessary to compensate for the loss of such loads upon the cessation of war activities.—*J. E. Loiseau, president and general manager.*

Southern Colorado Power

NO generating capacity was added during 1943. The only plant improvement was the installation of a 90,000-cfm. steam turbine driven forced draft fan in the Canon City plant.

Our engineering department is making a study and will prepare preliminary plans for the installation of a generating unit at either of three locations on our system, namely, as an addition to either the Pueblo or Canon City plants, or as a completely new location on the shore of a large lake located three miles from the city limits of Pueblo. The main considerations in connection with this study are:

The most feasible and adequate supply of cooling water, in connection with the cheapest delivered cost of fuel and, the necessary additional transmission lines to deliver the power to the

system load center which is Pueblo.

The object of this study and preliminary plans at this time is in order to be prepared to place orders for the necessary equipment and material when the end of the war is in sight so as to have the orders on the bottom of the pile.

Transmission — No transmission lines were constructed during 1943.

In connection with the above under generation, provided the proposed postwar generating capacity is located at the Canon City plant, a new additional 66-kv. transmission line will be required between Canon City and Pueblo, a distance of 36 miles. This line is to have transformers on each end and have a capacity of either 10,000 or 12,500 kva. which would be the probable size of the generating unit.

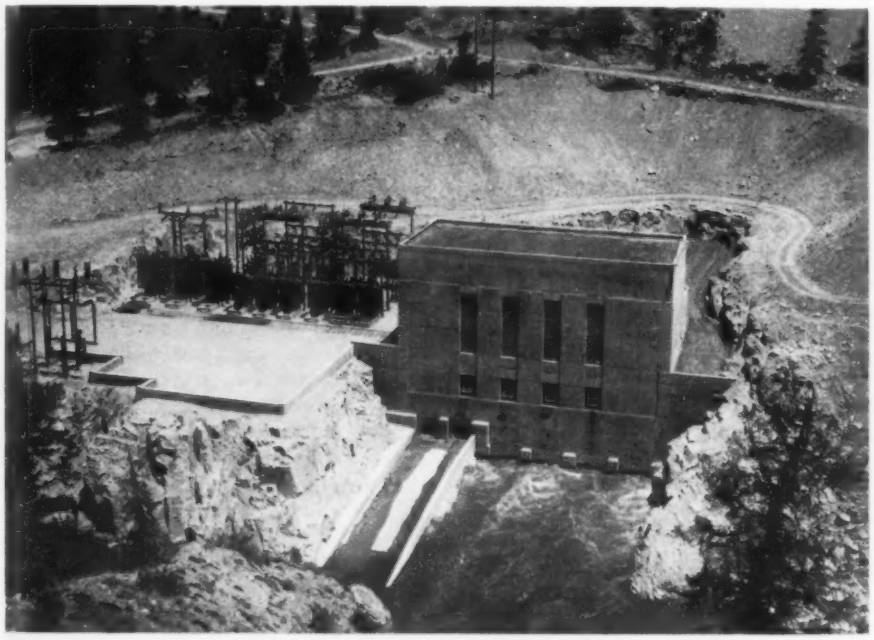
If located on the lake shore it would require parallel lines to the Pueblo plant about five miles and probably would be at 14.5 kv. which would be the generator voltage and also is our intermediate distribution voltage.

Distribution — On account of war restrictions, there were only 6.64 miles of distribution line extension during 1943.

Substations—One 1,000-kva. substation, 13.8 kv. to 2300/4160 "Y," was installed in Pueblo during 1943.

This substation is of the unit type with built-in step type regulators and air blast reclosing secondary breaker. It has nitrogen gas seal with automatic pressure control, automatic over-temperature control, and is wired underground, both primary and secondary without the use of case bushings, to the nearest pole.

The 1944 construction budget, covering minor plant improvements, transmission and distribution extensions, amounts to $80,000. Any extensive improvement will be an addition to this amount.—*M. E. Lord, vice-president in charge of operation.*



Completion of Green Mountain power house on USBR Colorado-Big Thompson Project added 20,000 kw. in 1943

Idaho

Idaho Power

GENERATION — This company has no steam generating plants. No additional capacity was installed at its hydro plants during 1943, although the rated capability capacity of the Thousand Springs plant was increased from 7,000 to 7,500 kw. and that of the Horseshoe Bend plant from 1,500 to 1,800 kw. A number of minor improvements which have been carried out during the past several years have enabled these plants to carry the additional load satisfactorily. No additional generating capacity is planned for 1944.

Transmission—Added during 1943 were 13.3 miles of 44-kv. line, 105.8 miles of 66-kv. line and 22.5 miles of 132-kv. line. The 44-kv. and 132-kv. lines were added to provide facilities to serve Army and Navy loads. The 66-kv. line just being completed is to serve a tungsten and mercury mining area in central Idaho. In addition to the above a section of approximately 16 miles of 44-kv. transmission line was rerouted to provide adequate clearance from a new Army air base. No new transmission lines are contemplated for construction during 1944.

Distribution — Approximately 40 miles of new distribution lines were added during the year. No rebuilding or modernization work has been carried on during this year. Our estimate of the construction of new distribution lines will amount to 35 miles for 1944.

Substations—A 1,500-kva. substation was installed to serve a new Army air base, and a 3,750-kva. substation was installed to serve the mining load in the vicinity of Stibnite. In addition a 25,000-kva., 132/44-kv., step-down substation was installed at Pocatello in connection with facilities to serve new Army and Navy loads near that point. No synchronous or static capacitors were installed during the year. No additional substation capacity is contemplated at this time for 1944.

Relaying—No special relays have been installed during 1943, except those in connection with the new transmission lines mentioned above. No new relay installations are contemplated for 1944.

Communication—During this year a telephone line was constructed on approximately one-half of the new 66-kv. transmission line serving central Idaho. No additions along this line are contemplated for 1944.

Tie-line load control—None of this type of equipment has been installed during 1943, nor is any contemplated for 1944.

Load-frequency control — None of this type of equipment has been installed during 1943, nor is it contemplated that any will be during 1944.

Some maintenance work has been deferred during 1943, all of which will probably be picked up gradually during the next few years as becomes necessary and other conditions permit. This is approximately as follows:

Hydro power plants	$25,000
Transmission	25,000
Transmission substations	2,500
Distribution	50,000
Distribution substations	5,000

No significant trends in the utility business have developed during the past year which will alter or influence future construction and operation.

It is not expected that very much time will be required to take up the slack of dumped war loads and get back to a normal construction period following the war. This company has a comparatively small amount of war load.—*B. C. Russell, assistant general superintendent.*

Boise-Anderson Ranch, USBR

CONSTRUCTION of Anderson Ranch Dam was continued on a restricted basis throughout fiscal year 1943, and was about 35% complete at the end of the fiscal year. Work on the power plant is stopped due to restric-

tion by the War Production Board. Work will be continued on the dam throughout fiscal year 1944. Other work will include clearing portions of the reservoir right-of-way, and relocation of roads. It is planned to have the dam completed to a sufficient height to permit some storage for the 1945 irrigation season. Funds available are $4,483,000.

Montana

Fort Peck Project, USBR

CONSTRUCTION of 20 miles of 33-kv. transmission line from Frazer to Wolf Point will be completed in 1944. Construction of 140 miles of 115-kv. transmission line from Fort Peck to Glendive, Mont., and a terminal substation at Glendive will be started if approval is obtained from WPB. Allotted to this project for 1944 is $497,000.

Nevada

Boulder Canyon Project, USBR

TWO 82,500-kva. generating units, No. A-2 and No. A-5, and the associated equipment were completed and placed in operation, making a total of eleven 82,500-kva. and one 40,000-kva. units in operation, in addition to two 3,000-kva. station-service units. The 165,000-kva. transformer bank for units N-7 and N-8 was installed and placed in operation in August 1943. This permitted taking advantage of some overload capacity in generator units N-5 and N-6, and thereby increasing the energy supplied to Basic Magnesium, Inc., near Las Vegas. The installation of unit N-7 and its auxiliary equipment is expected to be completed in the fiscal year of 1944. An extension of the Metropolitan Water District switchyard to permit service to the Basic Magnesium, Inc., load was completed and placed in operation. Grouting of dam abutments and foundations will be continued and channel improvements below the tunnel outlet portals will be underway. The current appropriation is $7,095,000.

Sierra Pacific Power

THERE is no construction to report for the past year and aside from distribution nothing is planned for 1944. Under miles of distribution line, we actually show a loss in 1943, and 1944 doesn't look any better. Preliminary figures for the electric department 1944 budget total only $58,000, covering principally small items of replacements. Our maintenance program is heavier than usual, partly because of the necessity for keeping skeleton crews busy during these times of little construction work. —*V. D. Armstrong, engineer.*

New Mexico

Albuquerque G. & E.

WE added no capacity to our system in 1943 and will add none in 1944.

We added about four miles of 44-kv. transmission line and a 600-kva. substation to serve a second army airport in Albuquerque. It does not look now as though we would make any further additions in 1944.

We constructed about 1½ miles of distribution line in 1943 and do not believe we will construct that much in 1944 unless WPB restrictions of Order U-1 are removed. We are endeavoring to keep up a normal maintenance program but have not been too successful due to lack of manpower.

We anticipate no particular slump in load in the postwar period and believe we can start in on a normal construction program as soon as men and material are available. — *Arthur Prager, president.*

Oregon

Bonneville Power Administration

COLUMBIA river power from the Grand Coulee and Bonneville power plants was the driving force behind a major part of the Pacific Northwest's expanded war production in 1943. During that period the Bonneville Power Administration delivered approximately 5,439,200,000 kwh. of energy to Northwest industrial plants and military establishments. At the year's end these customers were taking more than 800,000 kw. of prime power from the federal transmission network.

Included in this total were the five Pacific Northwest aluminum reduction plants, utilizing a total of 600,000 kw. in the production of approximately 600 million pounds of this vital war metal annually—30% of the nation's total output.

The Kaiser shipyards in the Portland-Vancouver area also relied directly or indirectly on Bonneville-Grand Coulee power for their record-breaking output of 292 ships during the year. Power demands of Bonneville's industrial customers increased approximately 72% during the past year, rising from 486,600 kw. in December 1942 to 836,600 kw. in December 1943.

In addition to its direct deliveries to Northwest industries, the Bonneville-Grand Coulee transmission system formed the backbone of the Northwest war power pool, interconnecting all major public and private power systems in the Pacific Northwest. During 1943 Bonneville's contribution to the pool amounted to as much as 68% net.

These tremendous contributions to the power requirements of the Pacific Northwest were made possible by the addition of 582,000 kw. to the combined generating capacity of the Grand Coulee and Bonneville power plants. Power installations at these plants during 1943 included:

4 units at Bonneville—54,000 kw. each
2 units at Grand Coulee—108,000 kw. each
2 units at Grand Coulee— 75,000 kw. each
(borrowed from Shasta plant)

This brings the total installed capacity of the two dams to 1,208,400 kw., with a maximum generating capacity of 1,402,000 kw., approximately one-half of the generating capacity of the entire Northwest region.

On December 14, 1943, the tenth and final generator was installed in the Bonneville power house, bringing this project to completion just ten years after it was started. Total rated capacity of the Bonneville power house now is 518,400 kw.

The better than half-million kilowatt increase in generating capacity at the two Columbia River dams was matched during the year by an increase of 580,500 kva. in substation capacity on the Bonneville-Grand Coulee transmission system. Greatest single contribution to the increase of substation capacity came with completion of Bonneville's Spokane substation late in the year. The Spokane substation, now the largest in the system, with a capacity of 500,000 kva., serves important war loads in the Spokane area.

A second important addition to the federal transmission system's substation capacity was made at the Covington, Wash., substation, where the station's second 75,000-kva. transformer bank was energized during the year. In addition, a 35,000-kva. synchronous condenser was placed in service at the Covington substation. Two 35,000-kva. synchronous condensers also were installed in the Spokane substation, one in the J. D. Ross substation near Vancouver, Wash., and another in one of the Defense Plant Corp. substations served by the Bonneville-Coulee network.

Although construction activity on the transmission system during 1943 was restricted to essential war projects, a total of 343 miles of new high-tension lines was added to the system during the year. Included were 177 miles of 115,000-volt circuits and 165 miles of 230,000-volt lines. In addi-

Bonneville's Total Energy Generated and Received, Total Energy Delivered and Energy Losses, Years 1942-1943

	1942 (kwh.)	1943* (kwh.)	Increase (kwh.)
Total Energy Generated and Received	4,285,670,317	7,844,101,541	3,558,431,224
Total Energy Delivered	4,008,409,356	7,439,508,131	3,431,098,775
Energy Losses	277,260,961	404,593,410	127,332,449

* The month of December, 1943, is estimated the same as November, 1943.

tion, a number of short low-voltage feeder lines were completed and placed in service to supply Northwest war industries and military establishments with Columbia River power.

At the year's end, the Bonneville-Grand Coulee transmission network consisted of 1,055 miles of 230,000-volt lines, 1,088 miles of 115,000-volt circuits and 366 miles of lower voltage lines. Fifty-three substations, located at strategic points over the 2,500-mile grid system, made possible delivery of power to war industries, military establishments, public agencies and private utilities throughout a large part of the Pacific Northwest.

Major additions to the system during 1943 included:

Transmission lines—Bonneville-Vancouver, two 115,000-volt lines, 37.4 miles each; Grand Coulee-Spokane, lines 3 and 4, 230,000 volts, 82.8 miles each; Walla Walla-Colfax, 115,000-volt line, 80.5 miles; Rainier-Longview, 115,000-volt loop, 11.66 miles; Spokane-Trentwood, 115,000-volt line No. 2, 10.7 miles; Bradford Island Crossing No. 4, 115,000-volt circuit.

Substations—Spokane substation, 100,000-kva. transformer banks No. 3, No. 4 and No. 5 energized; 150,000-kva. three-phase auto-transformer bank No. 2 energized; two 35,000-kva. synchronous condensers energized.

Covington substation, 75,000-kva. transformer bank energized; one 35,000-kva. synchronous condenser energized.

J. D. Ross substation, one 35,000-kva. synchronous condenser energized.

Tacoma substation, one 20,000-kva. synchronous condenser energized.

Additional plant construction approved for 1944 includes additions at Covington substation; installation of condensers at Alcoa substation; a service line for the U. S. Bureau of Mines at Albany, Ore.; completion of the Covington-Coulee 230-kv. line.

Bonneville Dam, U. S. Army

CONSTRUCTION work at Bonneville was completed in the year 1943, the last unit of 54,000 kw. being put into service on December 14.

The total installation consists of 10 units with a total capacity of 518,400 kw. The total capacity of the plant is now in use, the greater part of the output being used for the reduction of aluminum ore and for other war uses.

California Oregon Power

OUR company does not contemplate any additions to its generating system for the year 1944 except completion of work on the 1,000-kw. unit which was scheduled for 1943.

During 1943 the company rebuilt six miles of 66-kv. line and changed it from suspension type insulators to pin type. During 1944 about 16 miles of 66-kv. line will be rebuilt and other improvements involving about $30,000 are contemplated.

During 1943, 13 miles of distribution circuits were added, and about 18,000 kva. of substation capacity was added. During 1944 it is contemplated that about 60 miles of distribution circuits will be built, 10,000 kva. of substation capacity will be added, and substation improvements amounting to about $100,000 will be made.

The war has not developed any significant trends in the utility business insofar as our company is concerned which would support a statement on what we may expect during the postwar period.—*J. C. Boyle, vice-president and general manager.*

Eugene Water Board

DURING the year 1943 the activities of the Eugene Water Board were confined principally to the operation and maintenance of the system. The increase in business was not so great that large additions to the system were necessary during the year. New work is being postponed as much as possible. No major construction is planned for 1944.

Demands for the products of sawmills and farms has led to full community production, resulting in a small increase in population and electric consumption. Residential customers increased in number 1.8% during the year. The estimated kilowatt-hour per residential customer is 3,200. The number of residential customers using ranges is 56.5% and water heaters 31.6%.

The consumption in kwh. for all classes of customers is estimated to have increased 6% and the system peak increased 4.5%. The peak was 14,200 kw.—*J. W. McArthur, general superintendent-secretary.*

Eastern Oregon L. & P.

RECORDED facts now bear out the prediction for 1942 that our company and many other businesses in this inland area might be classed among the casualties of war. Gold mining and dredging operations were in all cases practically on a watchman basis. Several stores and service stations closed, and many others curtailed their use of service.

On the brighter side, the 1943 stream flow for the hydro plants and farm irrigation was the best in many years. The lumber mills, foundries and machine shops operated continuously. Several short rural extensions were built and there was a decided upturn in applications and inquiries for rural service. The residential load continued to increase, with such increase being largely absorbed by existing line and transformer capacities.

Our 1944 operations are expected to closely duplicate those of 1943, except that from early indications water conditions will not be nearly so good.

The editor has asked for an expression of opinion on postwar time required to take up the slack of dumped war loads. From this observation point in Baker, Ore., I believe that several years may elapse before additonal generating capacity may be required. A growth in the permanent population and in permanent industrial loads must first occur. Such growth would require the construction of many new transmission and distribution facilities.—*O. D. Lanning, chief engineer.*

Mountain States Power

NO NEW generating or transmission facilities were added during 1943. As the year closes a 66-kv. switching connection for standby is being made near Springfield, Ore., with the Eugene Water Board.

Approximately 30 miles of new distribution lines were built during the year and 2,800 kva. in static capacitors were added to various parts of the distribution system in the Willamette Valley. Plans call for an additional 3,200 kva. in capacitors to be installed during 1944.

A new 1,500-kva. 66/22-kv. substation was installed at Boyer, Ore., to serve the distribution system in north

Lincoln County. A 20,000-kva. transformer at Springfield, Ore., was equipped with fans for additional capacity. Switching equipment at the same location was also improved.—*G. McClellan, chief engineer.*

Northwestern Electric

THERE has been no change in generation in 1943, and none is contemplated for 1944 or 1945. With the installation of the tenth and final unit at Bonneville, together with seven units at Grand Coulee, and the efficient operation of the Northwest Power Pool, it is not likely that additional generating capacity on our system will be needed for some time.

Transmission—No appreciable change has been made in the length of our transmission lines. We are reconstructing the Condit-Camas 66-kv. transmission line which was built in 1912-1913. Of the total length of 48 miles, about 12.5 miles have been reconstructed and 8.5 miles more are planned for 1944. This work involves only the replacement of poles, crossarms, hardware and guys. The old insulators and conductors were used for the new reconstruction.

On December 15, 1943, jointly with Pacific Power & Light Co. and The Washington Water Power Co., we signed a contract with the Bonneville Power Administration for 20,000 kw. of prime power to serve as insurance in the event of unusual low-water conditions in the summer and fall of 1944. The establishment of a direct connection between our system and the Bonneville lines is planned. This will involve the installation of a 30,000-kva. substation and a short transmission line the length of which is not known at this time as the exact location of the substation has not been determined.

Distribution	Owned	Leased
Miles Added—1943	2.5	1.60
Miles Estimated to be Added—1944	3.0	2.00

On our system in the Washington district we are installing 114 shunt capacitors (1,700 kva.) and on the lines leased from Pacific Power & Light we will install 71 shunt capacitors (1,065 kva.) in 1944..

Substations	1943	1944
Transf. Cap. Added	7,000	3,000*

* To be approved postwar jobs.

In addition to above will be the proposed 30,000-kva. bank for connection with the Bonneville Power Administration.

The installation of a system net power interchange recorder is practically completed at our Lincoln generating station. This Leeds & Northrup equipment will record net interchange through the system from both Portland General Electric Co. and Pacific Power & Light Co. ties and will permit flat tie-line, bias frequency, selective frequency, or straight frequency control on this interchange. The equipment is system error indicating and will permit better operation of our ties with the Northwest Power Pool.

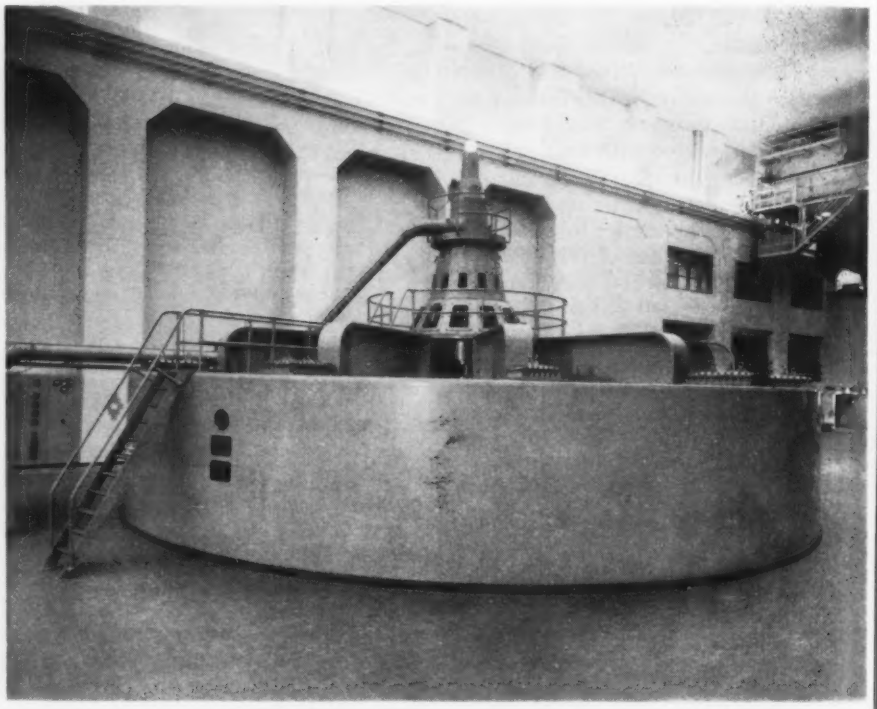
1944 Betterments—When the location of the site for the proposed Bonneville-Northwestern Electric Co. interconnection is definitely selected, telemetering and tie-line load control will be provided for this additional tie. It may also be necessary to remotely control switches by carrier current over our company-owned telephone lines.

Construction of two small portable two-way shortwave transmitter-receivers is progressing and should shortly be completed. These sets with very limited use of power will be of great benefit in providing communications during work on the 255-ft. Columbia River mast type tower. They will be very useful in providing emergency communications from Ione Reef or Lady Island to the Oregon shore during work on the tower crossing as well as being invaluable during work on dredging around our Columbia River 66-kv. submarine cables. After construction is completed, application will be made to the Federal Communication Commission for permission to use crystals now owned by the company on our allocated channels.

During the past year, many conversions have been made in our vacuum tube equipment. Where possible, tubes of better operating characteristics which are still available were substituted for those for which replacements can no longer be secured.

Deferred Maintenance

Steam	$ 3,200
Hydro	4,000
Transmission	None
Transmission Substations	2,000
Distribution	9,500
Distribution Substations	1,000
Total	$19,700



Bonneville reached its full capacity of 518,400 kw. when the tenth and final unit was placed in service Dec. 14, 1943

We have prepared a rather extensive program of postwar work consisting of revamping two 11-kv. substations, rebuilding one 66-kv. substation, increasing the capacity of one 1,500-kva.-66/11-kv. substation, to 3,000 kva. and using the 1,500 kva. transformers removed for another substation at a different location.

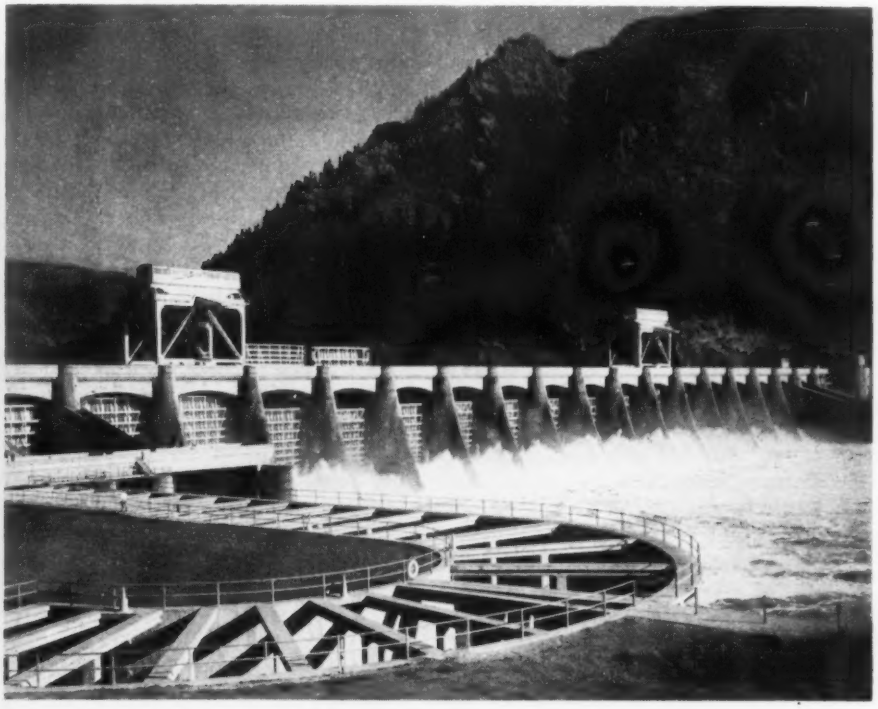
If approved, a 6,000-kva.-66/11-kv. substation will be installed in northeast Portland and our 66/11 kv.-transformer capacity at Lincoln station will be increased from 15,000 kva. to 30,000 kva.

We do not contemplate any large drop-off of load on our system after the war. Our shipyard load is not large and I believe the recovery will be rather rapid due to installation of additional electric devices in the home, increased illumination in office buildings and factories, and new industrial loads along the Pacific Coast caused by the impetus given to the West during the war.—*O. L. LeFever, general superintendent.*

Pacific Power & Light

DURING 1943 approximately $698,000 was expended for construction of new and improved facilities. The amount budgeted for similar expenditures in 1944 totals $485,000.

Generating capacity added during 1943 included a 750-kw. hydro-electric project on the Deschutes River at Cline Falls, Ore., replacing a 150-kw. plant.



Fish ladders and elevators (foreground) carry salmon over Bonneville dam to spawning grounds on upper Columbia

Also included as part of the project was the rebuilding of 4.4 miles of existing 6,900-volt line for 22-kv. operation. This project was started in 1942 and completed early in 1943. No additional generating capacity is contemplated in 1944 or 1945.

Construction of two sections of 22-kv. transmission line totaling 26.37 miles was completed in 1943. One section was constructed to provide electric service for a military project in central Oregon and the other to interconnect the company's Deschutes power system with the generating facilities of the Warm Springs Lumber Co. Construction of two additional interconnections with Bonneville Power Administration was started in 1943 with completion scheduled for early in 1944. These interconnections include 7.0 miles of 69-kv. transmission line and 4.68 miles of 115-kv. transmission line. Two substations, one of 12,000 kva. capacity and a second of 15,000 kva. capacity, are also included in the project.

Expenditures for distribution facilities totaled $263,927 in 1943 with $316,081 budgeted for similar expenditures in 1944. Of the total expenditure during the past year $105,000 was for expanding service to customers not previously served, including rural customers and a number of war housing projects. Due to a number of such projects still pending throughout the territory and general relaxation of WPB limitations with respect to extensions to rural customers, it is anticipated that expenditures of this nature in 1944 will exceed those in 1943.

Generally, construction in 1944 will be limited to that necessary to the war effort, increased food production and essential civilian services as was the program in 1943. Maintenance will necessarily be limited to the extent of available manpower and materials; however, it is anticipated that the company will emerge from the war with its properties in as satisfactory condition as possible giving consideration to the foregoing limiting factors.

Pacific company, unlike many utility companies, has not been called upon to furnish service to any number of large war projects. Growth during the past two years has been primarily in the residential and rural fields and at the close of hostilities little deviation in established trends of growth should be experienced for these classes of service. For this reason Pacific company contemplates returning to a normal construction program as soon as possible following the close of the war so that electric service may be extended to those many prospective customers who could not be served due to wartime restrictions. While this construction program will no doubt exceed any year during the period of the war, it is not anticipated that large scale construction expenditures in the immediate postwar period will be required to augment the company's present facilities.—*H. H. Schoolfield, general superintendent.*

Portland General Electric

COMPARATIVE figures covering the actual construction expenditures of Portland General Electric Co. for the year 1943 and estimated 1944 expenditures are as follows:

	Actual Expenditures 1943	Construction Budget 1944
Hydro	$ 552,000	$ 85,000
Steam	9,000	2,000
Transmission	205,000	223,000
Distribution	590,000	705,000
General	27,000	45,000
	$1,383,000	$1,060,000

During 1943, 12 pole line miles were added to transmission system, and 16 pole line miles were added to distribution system. The increase in substation capacity amounted to approximately 10,000 kva. Load control equipment was placed on order in 1943, but will not go into service until 1944.—*John Bankus, chief engineer.*

Utah

Telluride Power

IN 1943 we spent about $25,000 for property additions and improvements. Our expenditures in 1944 will depend largely upon the requirements of some mining operations for which RFC commitments have been made. If these projects do not go through, the expenditures will be about the same as in 1943.

No additional generating capacity was installed in 1943 except that an old water wheel was replaced with one of more recent design which should increase the generating capacity by about 50 kw.

We built only one mile of 44-kv. line to serve a compressor plant to experiment on the extraction of the aluminum from alunite ore. We anticipate building immediately about ten miles of 44-kv. line to make an interconnection with the Mt. Pleasant municipal power system. This job will also include the installation of a substation for the customer of 300-kva. capacity. The only additional substation capacity installed by the company in 1943 was one 100-kva. transformer added to

an open delta bank to increase the capacity of this bank. Approximately five miles of distribution line were added to serve outlying farms.

In 1944 we shall likely add about 25 miles of rural distribution lines.

We estimate that the dollar value of deferred maintenance is about $20,000. As soon as the materials and labor become available we shall take care of this maintenance and also the necessary reconstruction and enlargement, reconductoring, etc., which may cost up to $75,000.

Nothing has developed in the way of significant trends in our business that materially will alter or influence our future construction and operating procedure. Naturally we are always looking for methods of improving the details of our performance.

Aside from service to a war relocation center and some increased railroad business, we have not served any war needs, and therefore are not being concerned with the problem of taking up much slack when the war ends. We anticipate, however, a very active campaign to increase our domestic load through the connection of electric ranges and other appliances.—*Paul P. Ashworth, general manager.*

Utah Power & Light

DURING 1943 no additions to generating capacity were made and no units were rerated.

Additions to transmission lines were as follows:

Miles of 132-kv. line	46
Miles of 44-kv. line	21

Of the 46 miles of new 132-kv. lines added, 3.5 miles serve as a tap line to a new substation and 42.5 miles are embodied as an extension of the main trunk transmission system. The increase in 44-kv. line mileage is made up of customer taps. A section of 44-kv. line 71 miles in length was reinsulated for use at 132 kv.

Distribution line mileage added was 27 miles. Substation capacity added totaled 37,500 kva. of which 35,000 kva. is at new points of coupling between the 132-kv. transmission system and the 44-kv. system. Customer substations totaling 22,525 kva. were connected to the 44-kv. transmission system and an industrial interconnection of 25,000 kva. capacity was made on the 132-kv. transmission system.

No additions to generating capacity have been authorized for 1944.

Expected additions to the transmission system include only short extensions and customer taps, in addition to miscellaneous minor transmission improvements.

Prospect for distribution line extensions is better, principally because of the availability of line materials.

A moderate increase in substation capacity is expected.

In general, availability of materials and labor continues to be the controlling factor with respect to maintenance and construction work.—*T. A. Purton, chief engineer.*

Washington

Columbia Basin, USBR

TWO 75,000-kva. generating units which were originally purchased for installation in Shasta power plant of the Central Valley Project, were transferred to, installed, and placed in operation at the Grand Coulee power plant. All associated equipment for these two units, including the 230-kv. transmission lines to the left switchyard near the power house, was also installed and placed in operation. The 108,000-kw. generating unit L-6 was placed in operation in August 1943, and unit L-5 in November 1943. Work on the installation of the 108,000-kw. generating unit L-4 will be continued and it is scheduled to be placed in service in February 1944. Relocation of 15 miles of country road between Fort Spokane and Creston will be completed. Surveys and designs for irrigation features will be in progress, but no irrigation construction will be undertaken. The 1944 appropriation is $12,278,000.

Puget Sound P. & L.

PUGET Sound Power & Light Co. spent approximately $3,100,000 on construction work during 1943. It is anticipated that expenditures during 1944 will be under $2,000,000 for this work but, due to the uncertainty of conditions imposed by wartime restrictions and power requirements, it is difficult to forecast accurately.

No generating capacity was added at either hydro or steam plants during 1943 nor are any major additions to generating capacity contemplated for 1944. Minor replacements and improvements to generating plants were widely distributed and amounted to about $100,000 during 1943 and are estimated to be $50,000 for 1944. No new transmission lines were constructed during 1943 and none are contemplated in 1944. However, during 1943 an interconnection was made at Renton with the Milwaukee 110-kv. line to permit transferring larger amounts of energy over the Cascade Mountains. There were 70 miles of new distribution lines constructed during 1943. Rebuilding and improving of existing distribution and transmission lines totaled about $550,000.

There were seven new substations built in 1943 which total 11,400 kva. of capacity, and 42,000 kva. of transformer capacity have been added to various distribution substations throughout the system. There were 28,000 kva. of distribution transformers and 5,300 kva. of static capacitors added to the system during 1943. A 2,500-kva. mobile substation will be delivered in the early part of 1944. The number of customers increased 3,735 during the year 1943.

The 30,000-kva. transformer bank equipped with forced-air cooling was installed at Bremerton in the Bonneville connection. In order to conserve fuel oil at the Shuffleton steam plant by utilizing all available hydro generated energy from the Northwest Power Pool, an additional 30,000-kva. transformer bank with forced-air cooling was added at the Renton substation. Due to wartime difficulties, the installation of the 30,000-kva. synchronous condenser at the Canal substation will be made in 1944 instead of 1943 as previously reported.

During 1943 there were several major carrier and metallic relay installations completed. Many carrier telephone circuits were installed and several important telemetering connections established to facilitate the load dispatchers in operating this company's system in connection with the Northwest Power Pool. A carrier load control from the load dispatcher's office to two major generating stations is planned for 1944.

Due to governmental restrictions on building new lines and increasing copper on old lines, it has been necessary with the present war loads to maintain our lines in the best condition possible and therefore little, if any, deferred maintenance exists.—*Frank McLaughlin, president.*

Tacoma City Light

CONSTRUCTION continued during 1943 on Tacoma's new 90,000-kw., 400,000,000-kwh. Second Nisqually Development. The entire project, as of December 31, 1943, was approximately 75% complete. The initial step of 40,000 kw., providing approximately 226,000,000 kwh. annually, will be in operation by May 1, 1944. The balance is expected to be available possibly twelve months later. This will increase the present 114,000 kw. of hydro to 204,000, and the normal hydro generation to 850,000,000 kwh. annually, all supplemented by 34,000 kw. of normally cold steam standby capacity now installed. Anticipating the need for additional transmission capacity as a result of the increased generating facilities now nearing completion, two existing 30-mile

55-kv. lines have been re-insulated and are now ready for 110-kv. operation.

At the city's Tideflats substation, the terminus of the above 110-kv. lines as well as of the Seattle and Bonneville-Coulee 110-kv. interconnections, one 20,000-kva. synchronous condenser (and the foundation and appurtenances for another) was installed in July 1943. The second condenser, of equal rating, is expected to be in operation by May 1, 1944. In connection therewith, and as an additional supply to the nominal 50-kv. network, 84,000 kva. of 105/52.5/13.8 auto-transformer capacity was installed early in 1943 at the Tideflats substation.

The total 1943 gross generated and received amounted to 795,200,000 kwh., with a peak of 146,000 kw. The energy averaged but about 3⅓% greater than that for 1942, partly as a result of dimouts and partly because of the complete shut down of two large pulp plants, one of which is scheduled to reopen in February or March of 1944.

During 1943 the eleven largest public and private utilities in the five northwestern states, including Tacoma City Light, continued to function successfully as the Northwest Interconnected Systems Power Pool.—*Verne Kent, superintendent.*

Seattle City Light

DURING the past year no new generating capacity, either hydro or steam, was added. However, Lake Union 30,000-kw. steam plant has been rehabilitated and made ready for service on short notice. The second step of Ross Dam is now under construction, a nine million dollar project which will supply additional storage for the 120,000-kw. Diablo plant and the 57,000-kw. Gorge plant of our Skagit River development.

No new transmission lines have been added but several 26-kv. sub-transmission and distribution lines were installed to take care of the increased war load demands. In the year 1944 we plan the construction of two additional 26-kv. sub-transmission lines and the reinforcing of others by putting in larger conductor. In the year 1943, additions and extensions to our distribution system were made to take care of a 20 to 25% load increase. A large part of this increase, however, has been absorbed through wartime loading of existing facilities. The contemplated betterments for 1944 include the addition of eight 4,330-volt, three-phase, four-wire feeders. Our 1944 distribution construction program is expected to approximately equal that of 1943.

During 1943 we completed the construction of the Columbia distribution substation having a capacity of 9,000 kva., and have practically completed the construction of the Magnolia substation with an installed capacity of 6,000 kva. No synchronous condenser capacity has been added and practically no static capacitors.

We have had on order since early 1943 carrier current relaying, telemetering and communication equipment, which is scheduled for delivery and installation during the summer months of 1944. Incorporated in this equipment is tie-line load control equipment designed to maintain system interchange at scheduled values.

A survey to determine the estimated dollar value of deferred maintenance has not yet been completed, but arrangements have been made to finance such deferred maintenance. As soon as material and labor become available, it is our plan to proceed with maintenance that has been deferred on account of war conditions.

As a result of the war effort, we have found that the average load factor on our system has increased. We do not expect this increase to be permanent, since at the conclusion of the war, war industries in this area will be placed on a peacetime basis and probably on a one-shift basis. We therefore expect little change in system peak loads, but a reduction in kilowatt-hours delivered during the readjustment period. We expect our peak load to level off as soon as the peak of war production is reached in this area, and expect no substantial increase for several years after termination of the war.—*E. R. Hoffman, superintendent of lighting.*

Washington Water Power

CONSTRUCTION expenditures during 1943 totaled $402,000 and consisted principally of projects connected with military establishments, war industries and war housing. The construction budget for 1944 is estimated at $450,000 for gross electric construction.

The work budgeted at the beginning of 1943 included some items calculated to improve operations and thus increase the contribution of our system to the Northwest Power Pool as well as to immediate customers on the system. These were carried out to the limit of materials and manpower available and this policy will be continued in 1944.

Of paramount importance in our participation in the Northwest Power Pool was the installation of communications equipment and facilities for telemetering and tie-line load and frequency control. Our own transmission telephone system was revamped, making use of facilities leased from the Bell system in several instances. Our communications system was also tied in to the Bonneville carrier system to give direct communication to Grand Coulee and Vancouver, Wash.

Early in 1943 service telemetering and tie-line load and frequency control equipment were installed in the system operation office in Spokane to afford a continuous record of power flows between the system and all interconnected companies, the results being combined in a system net interchange meter. Due to changing conditions our telemetering and tie-line load control set-up is in need of some revision and the necessary equipment is on order and will be installed in 1944. Also on order for early delivery is equipment which, when installed, will give direct carrier communication with load dispatchers in Seattle, Butte and Portland.

Construction was started in 1942 on 5½ miles of 60-kv. transmission line to serve a military installation and this was completed and the line placed in operation early in 1943. During 1944 it is planned to relocate several miles of 60-kv. line in Spokane in need of rehabilitation.

Distribution systems were constructed in 1943 to serve three major housing projects in Spokane and one project in Ephrata, Wash. During the year several distribution systems adjacent to Spokane were converted to 13-kv. wye, grounded operation. In the plans for 1944 are projects involving the rebuilding of approximately 300 blocks of 4-kv. distribution system.

Transformer capacity was increased and additional feeders installed at several substations during the year. Two large substations were relocated to improve operating conditions. In 1944 additional feeders will be installed from three substations in the Spokane area but it is not expected that any additional substation capacity will be required.

During 1943 approximately $50,000 was spent in rebuilding penstocks serving two small hydro plants at Dalkena and Grangeville.

In respect to deferred maintenance it is expected that labor made available by the return of men in the armed forces will be sufficient to enable us to reach a current position within a year or two.

As regards the postwar period I might point out that the major war plants in this area have been supplied by federal plants, so that we do not expect industrial load losses except as they may be affected by a general recession. Normal construction activities will, of course, be resumed immediately after the conclusion of the war. —*J. E. E. Royer, vice-president and general manager.*

A MILLION AND A HALF KW. F

How the Industry Plans to Tackle Postwar Jo

LIKE the football team that, rushed off its feet in the first play, has at last held the opponent for downs and now has the ball and is driving it up the field slowly but consistently, the Allied team now has the offensive and is pushing the Axis aggregation back toward its own goal line. With this change in direction comes a change in viewpoint. The intense concentration of last year upon tooling up and producing enough of the materiel of war is no longer required and thought can be lifted, occasionally, from the actual task of producing to a future reconstruction period when the goal has been made and the game of war is ended.

Such is the position of the electrical industry at the end of 1943 and the beginning of 1944. The summary and review of what was done and sold last year is mostly for the record and to think about as the backlog of a producing industry that suddenly ceases to produce. The length of that backlog is surprising. The persistent demand for electricity and for electrical utilization equipment is encouragement for the future.

Just as it was ready for the unprecedented demands for power made upon it by war because it had been the custom of the industry to plan several years in advance, so to be ready to readjust to life after the war it is wise to do planning now. On the whole, the utilities of the West are planning. Some are more thorough in such plans than others and some are just beginning to turn their thoughts in that direction.

Because it is stimulating to those who plan to check their observations and plans against those of other companies similarly planning, and often provides a valuable interchange of ideas, ELECTRICAL WEST each year has endeavored to be a clearinghouse of the Industry's statistics and sales programs in this February issue. The statistics of 1943 have again been assembled, with the cooperation of 33 utilities, private and municipal, in the eleven Western states. Instead of sales programs, however, because they are nonexistent until hostilities cease, the postwar plans of these utilities have been polled and the results tabulated herein.

For brevity's sake, as much of the information as possible has been assembled in the accompanying tables. Explanatory or background information from some has been presented in the following columns to amplify the tables and to give more detail where the plans or the thinking expressed are interesting and valuable. Reasoning and local conditions often have a bearing on the plans made.

In assembling these reports it soon became apparent that 1943 saw an unprecedented increase in kilowatt-hour consumption increases per domestic consumer in a great many areas. In following up the original questionnaire sent to these utilities by *Electrical Merchandising*, each was asked to what this increase in kilowatt-hours could be attributed. The answers, given by many in response, are very revealing. They show definitely that the effect of war restrictions is in inverse ratio on electrical load—people stay home more, do more home cooking, canning, baking, reading; shift-workers extend the usage of electricity through the night hours; several families crowded into one house in critical housing areas put extra load on residential lines. In some instances this increase is as high as 400 and 500 kwh.

Incidentally, in cases where later figures were supplied, these will be found to differ slightly from the earlier ones supplied to *Electrical Merchandising*.

Number of domestic and farm customers increased practically everywhere in the West except in Sierra Pacific territory, where there was a loss of 253. This increase was very small in some instances, very great in the war production areas. If all those living in war housing projects and being served on a mastermeter as commercial customers could be counted as domestic customers, the increase would more truly reflect the influx of population to the West during the past year.

Where commercial customers include no such mass housing units, they tell of the decline of business among small stores and businesses. In cases where such housing blocks have supplanted the fallen off commercial load, this classification even shows increases over last year. The figures should be considered with such a factor in mind.

While commercial men have not given any figures as to what size of industrial load they will have to prepare to resell after the war, it is something that each postwar planner should take into his plans. The engineers estimate conservatively that there will be available for resale at least 1,500,000 kw. in the Pacific Coast states, with more kilowatts in large quantities from projects the federal government has regretfully laid away in waiting the war's end to launch in the Mountain states, as work making projects. It is significant that the peak of war production load probably was reached in December of 1943 and was handled by the already installed capacity at that time. And definitely scheduled for completion in 1944 are power plant units which will add 520,000 kw. to the available supply.

The size of the postwar job of load building is not being reflected as yet in the first tentative plans of the commercial men. Much of their thinking seems to be cast in the mold of prewar size and manpower and sales policy. Perhaps preoccupation with the increased details of serving war load now has kept them from realizing the magnitude of the challenge facing them. When the full appreciation of the size of the job strikes home to them and to their managements, far more fire will be put under the sales job of the future to raise its pressure and potency.

Whether it is private money or public money that is invested in generating plant, it exerts pressure upon distribution to see that the capacity is

FOR SALE

Appliance displays disappeared but Trading Posts, like this at Washington Water Power, in Spokane, took their places to assist customers in need

put to work to earn back that money. In the past, such pressure has had a marked effect upon sales policy, organization, aggressiveness and has involved various branches of the industry in conflicts until all elements could be organized to go to work at the problem together. The predominant response in favor of cooperative promotional programs with dealers after the war is a sign that this method of distribution of the predicted boom in merchandise will be followed.

To arrive at some base from which to start postwar marketing, *Electrical Merchandising* has produced in its January issue some valuable surveys. These are based on data from Edison Electric Institute and the Department of Census, the Bureau of Labor Statistics, the National Electrical Manufacturers Assn., the American Washer & Ironer Manufacturers' Assn. Such data which pertain to the Mountain and Pacific States is assembled in a table accompanying this comment.

Electrical Merchandising makes further breakdowns by segregating figures for urban, rural-non-farm and rural farm. Those figures are not repeated in the table herein, but may be found in the January issue of *Electrical Merchandising*.

Saturation figures given in that table indicate that the West is sometimes not as saturated with an appliance as the national average. This despite the tremendous job in appliance sales done in the region in the past. *Electrical Merchandising* says that there is a need for at least 4,100,000 new electric refrigerators and for the five years after the war, a minimum of 3,750,000 annually; 2,500,000 electric washers and 140,000 ironers, and a minimum of 2,300,000 washers and 270,000 ironers for the next five years; 775,000 new electric ranges, and 785,000 annually. Of this it is safe to say that the West should represent 16% of these potentials.

Another base valuable in predicating postwar market possibilities is to be found in the Chamber of Commerce of the United States sampling survey of families, both urban and rural, having net incomes under $4,000 annually. Applied to the known number of families in such categories in each of the utility systems territories, an index of immediate market appetite for replacement and purchase of new may be projected.

More than half, 51%, say they have accumulated savings equal to at least a tenth of their annual income with which to pay for such articles or use

The West's Wired Homes and Appliance Saturation As Appraised by Electrical Merchandising

State	Wired Homes Total Jan. 1, 1944	Wired Home Additions 1940-44	Wired Home Additions % 1940-44 to U. S. Total	Refrigerator Saturation: Total Homes with Elec. Refrig. Jan. 1, 1944	Refrigerator Saturation: % of State Wired Homes	Washer Saturation: Estimated Elec. & Gas Engine Jan. 1, 1944	Washer Saturation: % of State Wired Homes	Ironer Saturation: Total Homes with Electric Ironers Jan. 1, 1944	Ironer Saturation: % of State Wired Homes	Range Saturation: Total Homes with Electric Ranges Jan. 1, 1944	Range Saturation: % of State Wired Homes	Radio Saturation: Total Homes with Radio Jan. 1, 1944	Radio Saturation: % of State Total Homes
Montana	96,000	1,405	.04	65,551	68.28	84,474	87.99	8,527	8.88	24,541	25.56	146,400	87.09
Idaho	112,500	14,942	.44	75,483	67.10	71,620	63.66	6,977	6.20	42,268	37.57	131,150	87.53
Wyoming	43,400	5,205	.15	25,823	59.50	31,219	71.93	4,070	9.38	4,637	10.68	64,050	87.63
Colorado	233,900	26,396	.78	141,035	60.30	174,458	74.59	16,860	7.21	22,347	9.55	280,600	84.38
New Mexico	61,000	23,149	.68	35,755	58.61	29,382	48.17	1,938	3.18	3,495	5.73	73,200	54.14
Arizona	98,500	17,192	.51	63,565	64.53	67,947	68.98	6,202	6.30	7,365	7.48	94,550	68.09
Utah	144,100	27,327	.80	99,320	68.92	134,057	93.03	11,240	7.80	41,519	28.81	137,250	93.89
Nevada	26,500	5,489	.16	21,850	82.45	14,691	55.44	2,132	8.05	9,274	35.00	27,450	83.46
Mountain	815,900	118,295	3.48	528,382	64.76	607,848	74.50	57,946	7.10	155,446	19.05	954,650	81.13
Washington	522,000	74,590	2.19	311,864	59.74	354,425	67.90	50,776	9.73	175,504	33.62	512,400	91.05
Oregon	283,700	34,980	1.03	184,735	65.12	194,658	68.61	26,938	9.50	111,542	39.32	317,200	89.48
California	2,184,500	396,656	11.66	1,372,603	62.83	1,379,137	63.13	238,374	10.91	131,640	6.03	2,101,450	93.81
Pacific	2,990,200	506,226	14.88	1,869,202	62.51	1,928,220	64.48	316,088	10.57	418,686	14.00	2,931,050	92.83
United States	28,000,000 100.00%	3,400,716	100%	19,864,000	70.94%	18,364,000	65.59%	1,938,000	6.92%	3,567,000	12.74%	30,500,000	83.46%

CUSTOMERS AND CONSUMPTION

UTILITY TERRITORY	Average annual kw.-hr. consumption—Residential					Residential Customers			Farm Customers		Commercial Customers			Industrial Load change	Total all Customers	
	1943	1942	1941	1940	1939	1943	1942	Load change	1943	1942	1943	1942	Load change		1943	1942
Alameda, City of	1,250‡	1,201‡	1,044	1,080	1,142	13,000	12,293	+1,400 kw.			1,130	1,033	+400 kw.	+3,000 kw.	14,560	13,738
B. C. Elec. Ry., Vancouver	985‡	932‡	926	909	1,026	86,700	84,659	+1,100 kw.	17,900[3]	17,325[3]	15,650	15,566	+3,000 kw.	+15,000 kw.	120,250	117,550
B. C. Elec. Ry., Victoria	900	869	850	839	801	23,270	22,681			4,263	3,460	3,457			27,994	27,455
Calif. Elec. Power	1,350	1,328	1,314	1,349	1,376	22,700	22,251	+3,733,091 kw.-hr.	950	1,513	4,200*	5,434*	+2,333,565 kw.-hr.	+751,900 kw.-hr.	30,200	37,647
Calif.-Oregon Power	2,895	2,706	2,558	2,385	2,243	28,500	28,437		3,631	3,358	6,495	6,467			39,150	38,485
Central Aria. L. & P.		1,140	1,088	1,124	1,038		30,000†			890		4,500				35,000
Eastern Ore. L. & P.	1,413	1,305	1,167	1,056	919	5,751	5,453	+200 kw.	894		1,024	1,045		Same	7,669	7,388
El Paso Elec.	1,315	1,259	1,285	1,279	1,128	28,903	27,752		1,750	1,696	4,095	4,119	−250 kw.		34,168	33,800
Eugene Water Bd.	3,150	2,993	2,752	2,602	2,379	9,680†	9,523†	+500 kw. All			1,695	1,664			11,375	11,187
Glendale, City of	1,140	1,084	1,112	1,032	1,010	27,035	27,006			144	5,025	4,998			32,060	32,004
Hawaiian Electric	1,550	1,389	1,411	1,244	1,123	45,000†	44,892								55,000	54,183
Idaho Power Co.	2,360	2,137	2,018	1,946	1,855	42,450	41,829		19,100	18,372	11,135	10,351			72,750	70,617
Los Angeles B. P. & L.	1,023	977	998	954	886	457,848	449,200				81,423*	79,200*			549,417	537,900
Mountain States Power	1,650	1,534	1,410	1,362	1,286	47,000	45,560		8,500	8,431	8,300	8,305			63,800	62,296
Northwestern Elec.	2,734	2,180	1,720	1,529	1,423	41,617†	40,445†				6,272	6,112			48,964	47,624
Pacific Gas & Elec.	1,137**	1,068**	1,063	1,024	987	812,000†	790,994†		17,350	16,639	157,500*	158,162*			1,008,500	985,933
Pacific Power & Light	1,892	1,765	1,802	1,689	1,606	58,640	57,222	− 100 kw.			12,970	12,822	+500 kw.		90,166	88,854
Pasadena, City of	1,119	1,050	1,027	1,023	981	29,264	29,217				4,478	4,382		+1,000 kw.	33,742	33,599
Portland Gen. Elec.	2,218	1,935	1,698	1,518	1,390	137,354†	136,269†	+17.8%	(49,363)†	(51,000)†	13,319*	13,344*	+30.1%*		151,791	150,766
Public Serv. of Colo.	849	781	781	749	700	118,350	117,615	+8,560,958 kw.-hr.	5,810	5,541	16,635	17,091	+13,795,951 kw.-hr.	+17,639,442	147,367	147,159
Puget Sound P. & L.	2,260	1,997	1,716	1,511	1,391	208,000†	204,000†				23,000*	22,800*		+25,000 kw. All	231,000	226,800
San Diego G. & E.	1,048	1,074	1,135	994	953	93,019	99,951†	+12.1%			14,482	14,399	+.2%	+39.6%	112,615	119,399
Seattle City Light	2,994	2,612	2,062	1,703	1,492	88,000	86,653	+50,000,000 kw.-hr.			11,000	11,079		+21.29% All	100,150	98,878
Sheridan Co. Elec.	2,680	2,462	748	747	670	3,055	3,053	+31,000 kw.-hr.	723	688	472	497	+247,000 kw.-hr.	+468,000 kw.-hr.	4,250	4,238
Sierra Pacific Power	1,856	1,738	1,682	1,591	1,466	13,361†	13,514†				2,237	2,301			15,710	15,942
So. Calif. Edison Co.	1,013	983	1,005	984	972	482,435	468,031	+1,102 kw.	41,113	40,031	85,726*	83,940*	+38,968 kw.*		609,274	592,145
So. Colo. Power Co.	1,086	991	975	932	891	22,647	22,607	+48 kw.	1,834	1,664	2,963	3,015	+1,495 kw.	−8,167 kw.	28,555	28,471
Tacoma, City of	3,402	2,852	2,435	2,185	1,961	38,752	37,018	+23.26% kw.-hr.			3,727	3,915	+6.51% kw.-hr.	−3.19% kw.-hr.	43,730	42,210
Trinidad El. Tr. Ry. & G.	661	638		615	603	4,493	4,392	+50 kw.	700	691	1,235	1,230		+200 kw.*	6,428	6,313
Tucson G. E. L. & P.	4,055	3,142	1,014	987	932	9,601	9,106	+2,019,651 kw.-hr.	7,248	6,779	2,887	2,955	+264,093 kw.-hr.	+1,341,888 kw.-hr.	19,736	18,840
Uintah P. & L. Co.	850	800		585	505	550	477	+15 kw.	150	128	220	215	−10 kw.	+220 kw.	957	854
Utah Power & Light	1,328	1,243	1,246	1,212	1,140	124,331†	118,771†	+11.2%			13,716	12,425	+3.8%	+14%	140,372	134,784
Vallejo E. L. & P.	1,048	1,024				11,360	11,260				1,155	1,143			12,515	12,403
Washington Water Power	2,603	2,369	2,348	2,284	2,060	70,356	69,783	+5,100 kw.	12,898	12,858	11,936	13,218	+6,400 kw.	−7,800 kw.	96,206	96,854

*Includes industrial. †Includes farm customers. ‡Includes single-family dwellings only. **Exclusive of master metered apartments.
[1]Does not allow for one month's free electricity. [2]Includes farm but excludes flat-rate water heaters. [3]Includes rural towns. [4]Nine-month figures. All—indicates increases for all classes at load.

as down payments. Of the total 64% intend to buy as follows:

10.5% intend to buy automobiles
7.5 refrigerators
6.0 washing machines
4.7 stoves
4.0 vacuum cleaners
7.3 radios
2.4 sewing machines
4.3 electric irons
3.1 kitchen mixers
4.4 intend to build or buy a home

Thirty-nine per cent wish to make home improvements but, and this sets the challenge as to the postwar job in adequate wiring promotion, none mentions wiring additions or improvements specifically.

Prices and Channels

To find what utility commercial managers think about the talk concerning lower margins and get their opinions as to possible changes in distribution, several questions were asked them along these lines. A reading of their comments on this score reflect two points of view. There are those who think it would eliminate much trade-in abuse and chiseling, if margins were reduced and such reductions passed on to the appliance purchaser in lower cost. This lower cost, they feel, will make up in volume for lost margin.

Others feel equally certain that reduced margins will make it impossible for the small dealer to survive, will reduce sales effort in the field because it will fail to compensate salesmen enough to stimulate field selling, and throw the appliance business to the chains. Undoubtedly both arguments have merit. These opinions are what manufacturers, distributors, dealers and salesmen are also wondering about.

On the whole, though, it reflects a habit pattern and a solidity that so few visualize any radical changes in distribution, in policy, in sales personnel, in appliances sold or not sold by the utility, in promotional plans and methods. Few seem to be taking this complete blackout of the appliance and sales picture as an opportunity to swing to something different, something new.

Whether this is good, or not so good, whether it is an attitude that will be flexible enough to tackle the colossal task (and only that Hollywood word fits the magnitude of the task of selling the demobilized generating capacity which will be available after the war) and accomplish it, is not for these preliminary surveys to determine. When the time comes the same genius and capacity to do big jobs, which the phenomenal conversion to war production tested and found sufficient, will be turned to the peacetime task of reconversion.

California

City of Alameda

CHANGES likely to occur in the postwar period are that more distributors probably will open business to meet the customer demand. The special problem of distribution for the Pacific area will be transportation. Reduced margins would have no effect. Postwar price levels should be frozen at not over 10% over prewar.

Average annual kilowatt-hour consumption figures are based on the classification 600-1 and 600-3 classification and include single family dwellings only.—*G. A. Baxter, secretary.*

California Electric Power

NO changes of any consequence are anticipated to occur in distribution in this district. Various chains will probably expand outlets and become more active. We expect that the main problem for the Pacific area should the war in Europe end first would be an inability to supply the demand for merchandise. Reduction in margins would not affect distribution immediately. The volume and natural market would hold up net profit. Our guess as to postwar price levels is that they will be 50% higher.

As to the figures in the charts, they reflect the sale of a portion of the company's business to the Imperial Irrigation District. This means a loss of some 5,000 domestic and farm customers and about 800 commercial.

Kilowatt-hour increases per domestic customer over those of last year have been caused, at least in our system, by the shortage of adequate housing facilities to take care of the number of new people who have moved into this area. Consequently, many have moved in with other families or have connected their trailers on a meter which has been previously in use.—*Dudley Wheelock, general commercial manager.*

City of Glendale

RELATIVE to our merchandising program, the City of Glendale and dealers in this community have been unable to sell any electric ranges or water heaters during the past year. The department has put forth its endeavor toward maintenance of consumers' service to the equipment already in place. No tentative arrangements have been made for the future. Due to the shortage of help we cannot assemble any data on past year's service activities.—*P. Diederich, superintendent of public service.*

ESTIMATED APPLIANCE SALES, 1943 AND 1942—STOCKS REMAINING—SIZE OF STAFF

UTILITY TERRITORY	Estimated Dollar Volume Appliance Sales	Ranges		Water Heaters		Refrigerators		Washers	Ironers	Cleaners	Radios	Air Heaters	IES Lamps	Estimated Stock Remainings	Number Employed Sales Dept.	Number in Home Service
		1943	1942	1943	1942	1943	1942	1943	1943	1943	1943	1943	1943			
Alameda, City of	* $24,300	20	70	3	7	100	300	50	100		1,000			None	2	1
B. C. Elec. Ry., Vancouver	* 300,000	200	595	7	50	75	1,281	125		250	1,000	10		600 ranges, 100 cleaners, few others	26	4
B. C. Elec. Ry., Victoria	**		85		40		200								7	1
Calif. Elec. Power	**		225		143		380							None	5	2
Calif.-Oregon Power	†** 35,000	†† 100	1,019	†† 801		†† 60	†† 583							None	5	0
Central Ariz. L. & P.	*	59	109	22	82	61	345	20	10	30	150	8	228	None	3	0
Eastern Ore. L. & P.		77	404	91	363	26	578							12 water heaters	10	1
El Paso Elec.	**													Do no merchandising, gather no statistics	0	0
Eugene Water Bd.	**														0	1
Glendale, City of	**															
Hawaiian Electric	†	250	800	100	620	1,000	1,500	10	0	50				Unknown, but very limited	8	4
Idaho Power Co.		1,000	3,461	275	1,779	580	4,138	485	$1,000	320	2,000	‡‡ 50	3,700		28	3
Los Angeles B. P. & L.		550	2,080	450	1,382									Very few, used only	80	9
Mountain States Power	**														0	0
Northwestern Elec.	*		1,430		1,225		1,949							Small stock cleaners, lamps, none else	13	1
Pacific Gas & Elec.	*2,573,550	1,500	4,242	600	2,657	7,000	24,756	1,000	450	3,000	8,500	450		Practically none.	265	10
Pacific Power & Light	**		1,782		1,112		3,093								10	0
Pasadena, City of	†	202	218	8	40	146	843								2	1
Portland Gen. Elec.	*1,750,000	2,700	6,000	1,500	3,500	1,700	6,500	250	300	850	16,000		15,000	About 300 radios, 1,000 lamps	15	1
Public Serv. of Colo.		†† 132	†† 248	†† 19	†† 85	†† 263	†† 418		†† 19	†† 276	†† 19	†† 2	†† 525	5 ranges, 1 water heater, 2 ironers, 8 radios	79	5
Puget Sound P. & L.	†	†† 300	†† 750	†† 10	†† 825	†† 25	†† 120	100	50	250	750	50	5,000	100 radios, 1,000 IES lamps	42	8
San Diego G. & E.	† 375,000	50	400	50	450	2,500	3,000								4	0
Seattle City Light	*	1,922	8,420	1,126	8,138										21	3
Sheridan Co. Elec.	**														0	0
Sierra Pacific Power	*	343	566	62	149	172	589					4			15	1
So. Calif. Edison Co.	*	†† 1,500	2,319	458	957	590	12,584	105	60	550	3,859	356	3,200	None except frozen for military		0
So. Colo. Power Co.		†† 48	†† 133	†† 33	†† 44	†† 10	†† 83	†† 1	†† 1	†† 3	†† 0	†† 0	†† 21	None	4	0
Tacoma, City of	*	920	3,564			5	8	25	3	0	15			None	1	1
Trinidad El. Tr. Ry. & G.	†	17	20											None	1	0
Tucson G. E. L. & P.	**	..	..												2	0
Uintah P. & L. Co.	†**	0	15	2	10	0	40							None	0	0
Utah Power & Light	$1,678,377	1,128	3,232	308	982	2,776	5,759	281	64	919	3,138	41	8,538	None new, some used, all items.	60	9
Vallejo E. L. & P.	**													None	0	0
Washington Water Power	* 935,175	950	2,430	870	1,400	1,275	3,704	150	15	365	3,750	475	6,825	100 ranges, 100 radios, 1,500 lamps	18	4

†Estimated. *Dealer reports. **Lack of staff, no figures. ††Company sales only. ‡‡Air conditioning units. ‡Other heating devices, includes air heaters and ironers.
See "Customers—Consumption" table for average annual kw.-hr. and customer figures. See other tables for postwar plans and repair situation.

PRESENT WARTIME PROGRAM

UTILITY TERRITORY	What advertising is being done in 1944	APPLIANCE REPAIR SERVICE SITUATION				
		Parts supply	Dealers adequate	Utility does	New policy?	Whose responsibility after war—R., W. H. and Ref.?
Alameda, City of	Newspaper advertising.	.....	No	Ranges, Water Heaters	No	Ranges, water heaters, utility. Refrigerators, dealers.
B. C. Elec. Ry., Vancouver	"Reddy Kilowatt" adopted. Other activities depend on conditions.	Reasonable	Some, when labor available.	50% general, except radio, 25% major	No but sm. appliance repairs increased.	Dealer who sells them, backed up by distributors service and parts stock.
B. C. Elec. Ry., Victoria	See above.	Fair	Fair	Supply all public demands	No	Dealers who make sale should be prepared to service.
Calif. Elec. Power	War effort in local newspapers.	Fair	No	Appliances sold by company	No	Agency making the sale.
Calif. Oregon Power	General educational program in conserving appliances already in the field.	.....	Yes	Service dept. in each major town.	No	Joint responsibility of both utility and dealers.
Central Ariz. L. & P.	Voluntary conservation program, War Bond drives, goodwill advt.	O. K.	No	Take care of most repairs	Yes	Dealers.
El Paso Elec.	Same as 1943.	.....	Yes	Service those we have sold	No	Both utility and dealers.
Eugene Water Bd.	Plans not made. Probably in cooperation with dealers will carry small amount in local paper.	Do not know	Yes, though slow	None	No	Appliance dealer.
Glendale, City of	.....	.....	.....	Ranges and water heaters only	No	
Hawaiian Electric	Free enterprise, electricity conservation, care and use of appliances, radio program for enjoyment.	Fair	Fair	100% on lines handled.	No	Utility—ranges, water heaters. Dealers—refrigerators, etc.
Idaho Power Co.	Minimum, 50% less than prewar. Radio time increased for home service contact. Themes, care, use, conservation.	Meager	No	90%	No	Utility and any interested dealers.
Los Angeles B. P. & L.	Like 1943 unless major appliances are released. Theme appropriate to times, posters, newspapers, direct.	Satisfactory	Yes, backlog 2 to 3 weeks	None but ranges, w. heater, space heat.	No	Refrigerators—dealers. Ranges and water heaters—dealers as fast as abilities permit.
Mountain States Power	Approximately same as in 1943.	.....	Generally good	Service departments	No	
Northwestern Elec.	Newspaper, radio, direct mail, all tied to war effort, volume same as in 1943.	Adequate	Yes	Ranges and water heaters only	No	Hope plan may develop to transfer range and water heater service to dealers.
Pacific Gas & Elec.*	Contributing to war effort—Bonds, food preservation, nutrition, conservation, etc.	O. K. with leading makes	Yes—Refrigerators No—Ranges, W. H.	Ranges and water heaters only	No	Dealers service all appliances except perhaps ranges, water heaters.
Pacific Power & Light	Same budget as 1943, continue inform on wartime matters, conservation, and institutional selling.	Fair	Yes, except where no dealers	To supplement where no dealers	No	Dealer who makes sale and holds manufacturer's franchise.
Pasadena, City of	Monthly direct mail to consumers.	Fair	No	Complete service on all appliances.	No	Utilities, to insure proper consumer relations.
Portland Gen. Elec.	If equipment available, will encourage sales. If not, institutional and educational.	Adequate except some makes refr.	Yes except ranges and water heaters	Ranges and water heaters	No	Distributors and independent service companies.
Public Serv. of Colo.	Until conditions change, educational, patriotic and dealer cooperative advertising to be continued.	Short and delivery slow	No	Extent necessary	Yes	Those who sell. Where not, have to be done by service agencies or utility if able provide parts.
Puget Sound P. & L.	Not ready.	Low	No	Ranges, water heaters and refrig.	No	Utilities at first, then service organizations as fast as possible.
San Diego G. & E.	Continuation of care and use and cooperation with Bureau of Radio and Electrical Appliances.	.....	Yes	Only those company sold	No	Would like to have dealers handle all service after war.
Seattle City Light	Full strength of 1941 advertising.	A handicap not improving.	No, short of labor and parts	Ranges, water heaters and com.	No	Where saturation high, utility should service ranges, water heaters. Refrigerators not utility job.
Sheridan Co. Elec.	None at present.	.....	No	What dealers cannot do	No	Dealers and utility.
Sierra Pacific Power	Repair and maintain existing appliances, conservation, assist in all war drives.	Fair	Yes	Only minor	No	Should be the utility but dealer does not want to lose customer contact.
So. Calif. Edison Co.	Undecided except to selected groups such as home builders, architects.	.....	No	Ranges, water heaters, small where no dealers	No Yes	Dealer.
So. Colo. Power Co.	Largely institutional and patriotic.	.....	No	Probably 98%	No	Utility on ranges, water heaters. Questionable on refrigerators.
Tacoma, City of	Continue Hotpoint Bond selling campaign started in 1943, using billboard and newspaper ads.	Scarce	No	Ranges only	No	Joint responsibility of utility and dealers.
Trinidad El. Tr. Ry. & G.	Institutional, conservation and cooperative.	.....	.....	None	No	Dealers.
Tucson G. E. L. & P.	General institutional and cooperation with civic and war programs.	.....	Handle all repairs	None	No	
Uintah P. & L. Co.	About same as 1943, depending upon war conditions.	Fair	No	About 75%	No	Dealers and contract service men.
Utah Power & Light	Practically same amount allocated for 1944 as in 1943.	Satisfactory at present	Yes, dealers and utility	About 10%	No	Should continue as at present.
Vallejo E. L. & P.	.....	.....	Yes	None	No	Dealers.
Washington Water Power	Institutional.	.....	.....	About 60%	No	Dealers.

*See accompanying utility report for more details or interpretation.

Los Angeles Bureau Power & Light

LARGER sales through chain stores, fewer small dealers, merchant plumbers will take on electric lines, and we expect distributors to do a better promotional job—these are what we look forward to in the postwar period. New types of retailers will include merchant plumbers, speculative builders and auto accessory chains.

If the war ends in Europe first, local postwar planning is not as far advanced as it should be fully to capitalize on the market should appliances become available in quantities on short notice.

Reduction in margins, in our opinion, would be a long step forward. We cannot see any justification for the distribution costs to equal and in some instances be greater than manufacturing costs. Reduction in margins would reduce chiseling, foster better selling, enlarge volume of better dealers, reduce cost to purchaser and thereby gain acceptance of lower saturation items.

Postwar price levels depend on the value of the dollar. If compared on a normal base, we expect ample manpower, ample manufacturing plants, keener competition and therefore equal or probably lower price levels.

Recent developments in our postwar planning include: a survey of existing merchandising outlets and a study of them to determine the need for additional outlets in comparison with the number of consumers in various districts within our system; the immediate re-establishment of a large housing project and tract development unit, because of increased activity in this field, to work with builders and developers. Originally this function was planned for the postwar period. Up-to-date lists of lending institutions, building contractors and electrical contractors are being compiled, to whom will be sent direct-mail information on the advantages of adequate wiring and the all-electric kitchen as related to their respective businesses.

In the lighting field, for domestic lighting we will continue as in prewar, watching carefully the possible use of fluorescent lighting. The postwar era in lighting will involve many technological developments. We will educate our consultants and other field contact men and will continue to make lighting recommendations for various types of commercial and industrial applications. We will advertise, probably by direct mail, the advantages of good illumination.

We do not anticipate very much addition to our present street lighting system. Such activity will be mostly modernization of existing systems.

For adequate wiring we will have an architectural service bureau and will again promote national adequate wiring programs. We will again have a specialist working with electrical contractors.

Our advertising in 1944, unless major appliances are released for free sale, will continue as in 1943. The theme will be appropriate to the conditions at the time. We will use four outdoor posters per year, a 40-in. newspaper ad every two weeks, continue periodical and direct-mail advertising.

As to the service situation, we service ranges, water heaters and space heaters only. This is on a basis of free labor and transportation with parts on a cost plus basis. After the war we feel that refrigerator service is up to the servicing dealers and that on ranges and water heaters the utility should pass the service over to dealers as fast as acceptance and their ability to handle will permit. The utility should retain only comparable service to that offered by the competing gas company.

The increase in kilowatt-hour consumption per residential consumer over the 1942 figure of 977 kilowatt-hours results, we believe, from many causes among which are: Increased use of lighting and existing appliances because of delays in outside services, such as laundry; irregular working hours caused by the three-shift working schedules in war plants; the doubling-up of families because of the housing shortages.

Figures of appliance sales are actual for ranges and water heaters for 1942 with estimates based on actual installations up to November for the 1943 figures.—*Charles B. Snyder, business agent.*

Pacific Gas and Electric

INCREASED tendency for direct sale from manufacturer to dealer, bypassing the jobber, to decrease distribution costs may be expected after the war. Additional chain stores are anticipated, such as Firestone, Goodyear, etc.

As to reduction in margins, if functional discounts replace quantity discounts the smaller retailer will be benefited and the larger dealer penalized. Dealer advertising will decrease. Solicitation will decrease.

Our guess is that price levels should be higher for a period of at least two years or until production volume makes possible decreased production cost. Government price control will undoubtedly continue.

If the war ends in Europe first we can expect the manpower shortage to continue, thereby making conversion to civilian goods more difficult. Also, transportation will become an obstacle to shipment from the East and the Middle West.

Our own postwar plans in the lighting field call for general promotion, direct sales and sales through dealers of domestic lighting and aggressive stimulation, with equipment sales through dealer channels, in commercial and industrial. In street lighting, an aggressive campaign to increase street lighting sales will be carried on to increase this load 10% per year for several years following the end of hostilities.

Doerr

As to wiring, it has become the real bottleneck of the whole electrical industry. We intend to do far more to bring about the installation of adequate electrical facilities than ever before.

After the war dealers should service all electric appliances with the possible exception of ranges and water heaters. There is some question as to the advisability of the utility leaving this latter service to dealers or whether it would be wise to charge a price equivalent to what a dealer would be obliged to charged for such service.

Our postwar dealer program calls for promotion of appliances sold exclusively by dealers through cooperative organizations such as Northern California Electrical Bureau. We will provide specialists to work with dealers individually and collectively on their merchandising and advertising programs. We hope to organize and conduct sales training classes for dealer personnel.

The year 1944 will be a year of decision as to our course of action in the early postwar period. Until our studies have been completed, we are not in a position to furnish any revision of the estimates given you in the questionnaire.

The rather abrupt rise in domestic kilowatt-hour usage in 1943 cannot be attributed to any specific load condition or situation such as you have suggested; however, we are assigning the following reasons which may or may not be complete or accurate in every respect:

1. More money was available and, therefore, householder utilized equipment and electricity more freely especially for lighting.

2. There was a great tendency for more people to live in the same dwelling; in some cases more than one fam-

POSTWAR PLANS

UTILITY TERRITORY	Making Plans Now	Will Sell Appliances	Will Sell Ranges	Will Sell Water Heaters	Will Sell Refrig-erators	Will Sell Lamps	Will Sell Complete Line	Size of P. W. Staff	Type of Dealer Program Planned	Dealers			
										In 1941	Left in 1943	By end of War	Enough to Start Again?
Alameda, City of	Yes	No	No	No	No	No	No	Same as prewar	Advertising and free wiring for domestic electric equipment.	7	3	?	No
B. C. Elec. Ry., Vancouver	Yes	Yes	Yes	Yes	Yes	Yes	No	Not determined	Cooperative plan, changed from time to time to suit varying conditions found.	151	130	90%	Yes
B. C. Elec. Ry., Victoria*	At Vancouver office	Yes	Yes	Yes	Yes	Yes	No	Not determined	See above.	14	14	100%	Yes
Calif. Elec. Power*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Probably larger	Not definite, but probably a cooperative sales and financing plan of some kind.	No record	No record	No record	No
Calif.-Oregon Power	Yes	Yes	Yes	Yes				Slightly reduced	Cooperative advertising and field work.	29	24	Approx. 80%	Yes
Eastern Ore. L. & P.	No	No						Same	Advertising allowances to dealers and salesmen to help with dealers' problems and sales programs.	30	15	50%	Yes
El Paso Elec.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Same	Aggressive program.	50	23	20%	Yes
Eugene Water Bd.	No	None							We have no "New Business" department. No program.	20	12	?	Yes
Glendale, City of*	No								No tentative arrangements made for the future.				
Hawaiian Electric	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Perhaps larger	Similar to prewar program, cooperative advertising, free range and heater installation.	70	30	33—%	Depends on available merch.
Idaho Power Co.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	About 50% of prewar sales crew	Help dealers sell as much as possible; company sales where dealers cannot do necessary job.	440	390	85%	Yes
Los Angeles B. P. & L.*	Yes	No						Approx. the same.	Services of home repres.; wiring and plumbing allowances, coop. advt. coordination of sales.	160	80	50%	Yes
Mountain States Power	Not as yet	In some districts	Yes	Yes		Yes			Will set up a department to carry on educational and promotional work with dealers.	?	?	?	Plenty of dealers
Northwestern Elec.*	Yes	No	No	No	No	No	No	Approx. the same size and character	One of assisting dealers in the sale of electrical appliances.	240	223	?	Yes
Pacific Gas & Elec.*	Yes	Some	Yes	Yes	No	Yes	No	At least as many	Promotion through No. Cal. Elec. Bureau. Specialists to work with dealers. Sales training classes.	1,651	1,315	70%	Yes
Pacific Power & Light*	Yes	Not determined yet	?	?	?	?	?	No	Full cooperation with dealers who will be main source of supply for utilization devices.	254 selling major App.	150	25 to 50%	Yes if supply is limited
Pasadena, City of	No	None						Yes	Advertising, range wiring, general sales assistance.	35	10	30%	No
Portland Gen. Elec.*	Yes, in general	None	No	No	No	No	No	About the same	Very similar to dealer promotion program followed before appliance manufacture stopped.	200	155	75%	Yes
Public Serv. of Colo.*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Probably larger	Through RMEL a synchronized and coop. advt. program. Other possibilities also under consideration.	Approx. 125 31	31	25%	Yes, most are utility and dept. stores.
Puget Sound P. & L.	Yes	No	No	No	No	No	No	Larger	Aggressive and expanded over prewar.	?	?	?	No
San Diego G. & E.	Yes	Undetermined as yet.	?	?	?	?	?	Same	Continued coop. in dealer sa les program, handled by Bur. Radio & Electrical Appliances.	200	175	82½%	Yes
Seattle City Light*	Yes	Only	Yes	Yes	No	No	No	General plan is the same	Continue helpful installation service, encourage and assist dealers, stress water heating.	?	?	?	Yes
Sheridan Co. Elec.	No	None						Not applicable	None at present.	8	4	50%	Yes
Sierra Pacific Power*	Yes	No	No	No	No	No	No	Yes, same	Reno plan, in operation since 1932 without change in fundamental policy.	65	32	50%	No
So. Calif. Edison Co.	Yes	Yes	Yes	Yes	No	Yes	No	Yes, same	Cooperative.	331	175	?	Yes
So. Colo. Power Co.*	Yes	Yes	Yes	Yes	Yes	Yes	Probably	Same	No definite plan yet.	25 Pueblo only	23	70 to 80%	With increased personnel, yes
Tacoma, City of	Yes	Some	Yes	Yes	Yes	Yes		Same at start	Will depend on postwar demands and conditions as well as available supplies.	23	10	33—%	Yes
Trinidad E., Tr. Ry. & G.	Yes	No	No	No	No	Yes	No	Same	Cooperative advertising, sales promotional assistance.				Yes
Tucson G. E. L. & P.	No	No plans							Present status does not permit making plans.	30	20	?	Yes
Uintah P. & L. Co.*	Yes	Yes	Yes	Yes	Yes	Yes		Larger staff	Dealer coordination plan.	10	4	4	Yes
Utah Power & Light*	Yes	No	No	No	No	No	No	Practically same	Promotional program to help dealers in any way that then appears necessary.	661	565	75% (handling other Mdse.)	Yes
Vallejo E. L. & P.	No	None							None.	8	7	50%	Yes
Washington Water Power	Yes	Some	Yes	Yes		Yes			About same as prewar.	192	170	60%	Yes

*See accompanying story for further details or interpretation.

ily; in others rooms were rented out: in others wives and other members of the families of soldiers moved in with relatives. This brought about an increase in meals and all uses of electricity.

3. Two- and three-shift operation also was undoubtedly a factor. This caused a greater use of energy in order to keep the household going over longer hours.

4. The fact that laundries were completely swamped and it was difficult for homes to get laundry done out satisfactorily contributed to more laundry being done at home and this no doubt had an effect.

5. We are of the opinion that gas rationing kept people at home more and therefore they used more electricity. During the early part of the year undoubtedly blackout conditions contributed to people staying at home and this had an effect.

6. In the rural territory unquestionably electric heating accounted for a considerable increase in domestic usage, especially in territories where very little wood was available because there was no one to cut it. In some instances the increase in usage in the rural territories was greater than in the metropolitan areas. It would seem that this was an important factor in these areas because Items 2, 3, and 4, would not apply.

Until the war is over our efforts and activities will continue much as they have been during the present year under our "Wartime Sales Service Program."—*O. R. Doerr, general sales manager.*

City of Pasadena

IN our opinion distribution of electrical appliances in this district will be limited to electrical dealers, not to corner drug stores. There will be a return of old dealers when merchandise is available. War ending in Europe first would limit supply in the Pacific area due to lack of transportation. As to reduced margins, if reduction is carried on to the consumer sales will be heavy. Our guess as to price levels is that they will be lower. —*B. F. DeLanty, general manager.*

San Diego Gas & Electric Co.

MORE distributors and more dealers and several new chain store operations are to be expected in the postwar period. As to margin reduction, distributors and dealers expect reduced margins. Price levels at first will be higher and later lower. Transportation problems can be expected if the war ends in Europe first.

In the tables you will note a considerable drop in Load Changes, for the item of "Commercial" with a counter-balancing increase in "Power." This is due mainly to a shifting of a number of large government establishments from commercial lighting rates to a new combination power rate. Also there was a change in rate set-up for some municipal accounts which caused these accounts to be transferred to the "Commercial" Classification.

As to the question concerning the continued increase in residential consumption, I can say definitely it was not due to war housing projects on master meters, as such meters are not included in the residential classification. Also, it does not appear that a great deal of the increase was due to the use of electric heaters, as the increase was about the same in the summer months as in winter.

We attribute the increase to two main causes. First, there is undoubtedly a great deal of doubling up in single family houses. Furthermore, these extra people are probably using all sorts of small electrical appliances such as toasters and coffee-makers to prepare some of their meals. There is also the factor of the unusual hours that these war workers must spend in the home. Some work on shifts which require a very early start and thus an unusual morning lighting load. Others come home late, after a part-night shift, and again we have unusual lighting after midnight.

Of course, we must also recognize the influence of the general economic situation. People are not worrying these days about the small item of expense which is attributable to their electric bill.—*A. E. Holloway, vice-president in charge of sales.*

Clark, have you done any postwar planning?

From Passing Smiles, issued by Thomas & Betts Co., Inc., Elizabeth, N. J.

Southern California Edison

NEW types of retailers who will enter the field undoubtedly will be chain stores, lumber dealers and rubber companies. Reduction in margins would have very little effect. It is expected but will tend to eliminate small dealers. Postwar price levels will be the same or slightly higher.

McFadden

It is interesting that in 1942 we had 225 dealers reporting and in 1943, in January, 62 and in October only 45. —*Robert L. McFadden, general commercial manager.*

Colorado

Public Service of Colorado

PROBABLY there will be increased sales by manufacturers or their agents direct to retailers instead of through jobbers in the postwar period. In all probability existing and new firms will take on affiliated or related lines for sale in their stores. Wiremen, plumbers and tinners may sell appliances in their stores. They probably will not go into territory selling. Reduction in margins would probably discourage small dealers from starting in the appliance business and curtail territory selling by such small dealers and department stores except on a straight commission basis. Utilities may have to do much promotional advertising and work. Postwar price levels will probably start higher, with gradual reduction as production facilities are improved and cheap plants are obtainable.

Amplifying on other questions, our own postwar plans in respect to adequate wiring are to cooperate with the Rocky Mountain Electrical League in an attempt to educate electricians, wiring contractors, builders, architects, homemakers and the industry as to the desirability for and economy in adequate wiring.

As to servicing responsibility, it should be that of those who sold the appliances. Where such agencies are not available it will have to be done by general servicing agencies or the utility, whichever is in the position to provide the parts.

Figures in the tables are in accordance with the accepted classification of accounts and the answers to many are estimates and should be considered

POSTWAR PLANS

UTILITY TERRITORY	Lighting Plans, all classes	Adequate Wiring	Commercial Cooking	Making Market Study	Estimate of Postwar Volume of Sales for 5 Years in Percent of 5 Prewar Years				
					Ranges	Water Heaters	Refrig-erators	Washers	Radios
Alameda, City of	Continue program to replace obsolete type of street lights.	No change.	None.	Yes both obsol. and pop.	200%	200%	300%	300%	200%
B. C. Elec. Ry., Vancouver	Intensive promotion of lighting in all sections. Tie-in with national plans for improved street and highway lighting.	Elec. Serv. League to continue active Red Seal wiring promotion.	Plans not yet completed.	Yes	200%	1,000%	200%	110%	100%
B. C. Elec. Ry., Victoria	See above.	See above.	See above.	No	200%	200%	200%	150%	100%
Calif. Elec. Power	Actively promote, design and engineer lighting.	Promote in cooperation with PCEA plans.	No plans yet.	Not yet					
Calif.-Oregon Power	Not yet determined.	Not determined.	Not determined.	Yes	150%	150%	150%	150%	150%
El Paso Elec.	Aggressive promotion.		None, natural gas of 1,050 btu. at low cost makes unattractive.	Yes both obsol. and pop.	110%	120%	120%	300%	
Hawaiian Electric	Active promotion and sales in keeping with new developments.	Same as for lighting.	Will be greatly expanded.	Yes both obsol. and pop.	100%	100%	50%	150%	200%
Idaho Power Co.	Continued active promotion by direct contact and advertising.	Same as lighting.	Same as for lighting.	No figures available yet.	100%	100%	100%	100%	100%
Los Angeles B. P. & L.	Domestic—watching use of fluorescent. Comm. & Ind. educate consultants to make recommendations.	Arch. service bureau, promote AW program, specialist in field.	Adequate sales promotion, cooperation with manufacturers and dealers.	Yes both pop. and obsol.	150%	175%			
Mountain States Power	No plans yet.	No plans yet.	No plans yet.	Yes, population.	Substanti market.	al increase.	Obsolesce	nce will ma	ke a large
Northwestern Elec.*	Domestic, limited promotion. Very active sales program on commercial, industrial, street.	Promotion through dealers, contractors and builders.	Promote actively through dealers.	Yes*	150%	125%	150%	150%	125%
Pacific Gas & Elec.*	Domestic sales direct and thru dealers. Comm. & Ind. aggressive stimulation thru dealers.	The bottleneck—we intend to do far more than ever before.	General promotion of counter and pantry equipment.	Yes, complete market studies	190%	190%	130%	140%	130%
Pacific Power & Light	To continue all-service selling which includes lighting.	Encourage contractors to sell adequate wiring for future.	Continue all-service selling. Equipment sold by dealers.	Not yet	No estima	tes made y	et.		
Pasadena, City of	General consumer education in domestic, comm. and industrial. Street light modernizing.	Cooperate with the national organizations.	Limited promotions.	No	No estima	tes.			
Portland Gen. Elec.*	Same as prewar. See letter.	Representatives work closely with architects and builders.	Will increase staff to work with supply houses in this field.	Nothing definite yet.	No estima	tes. See le	tter.		
Public Ser. of Colo.*	Increased personnel of specialists and extensive dealer cooperation.	Cooperate with RMEL in educational program.	Not yet formulated.	Yes, pop. obsol. and new prod.	175%	200%	250%	200%	200%
Puget Sound P. & L.	Incomplete.	Incomplete.	Incomplete.	Yes, pop. and obsol.	No estima	tes.			
San Diego G. & E.	Specialists in home lighting, commercial and industrial.	Plan to have specialists working on wiring.	None.	Yes, pop. and obsol.	200%	200%	110%	135%	150%
Seattle City Light*	No domestic as yet. Layout engineering service for customers. New street light reflector equipment.	Continue advertising value of adequate wiring.	Low rates encourage and create customer acceptance.	Yes	Expect ra automatic	nge replace tank w. he	ment 8,000 aters 6,000	per year, per year.	3,000 new;
Sierra Pacific Power	General advertising and cooperation with architects, contractors, dealers, etc.	General advertising.	Advertising; actual selling by dealers.	No	No estima	tes.			
So. Calif. Edison Co.	Will promote all forms of lighting.	With loan agencies, classes to prospective home builders.	Will be very active.	Yes, all types	Estimates	not compl	ete.		
So. Colo. Power Co.*	All needs modernization.	Intend to promote more than ever.	Intend to promote.	Yes, obsol. pop. and new prod.	No estima	tes yet.			
Tacoma, City of	Uncertain.	Uncertain.	Actively promote for both new and replacement of worn equipment.	Yes, both	No estima	tes yet.			
Trinidad El. Tr. Ry. & G.	Advertising and personal contact promotion.	Urge it through advertising.	None.	No	No estima	tes.			
Uintah P. & L. Co.	Have not in past. After war plan to have sales force for lighting.	Extensive advertising and education.	Little call for this.	Yes, pop.	200%	200%	100%	100%	100%
Utah Power & Light	Not determined yet but will have promotional program.	Not determined, but will have program.	Not determined but will promote.	Not as yet	No estima	tes.			

*See accompanying story for further details or interpretation.

accordingly. The average annual kilowatt-hour consumption per residence customer is for urban customers only. The present activities of our sales department are substantially the same as those outlined last year.—*G. B. Buck, vice-president and assistant general manager.*

Southern Colorado Power Co.

WHAT new types of retailers will enter the field? Individuals expecting to cash in on the huge backlog of business built up during the war. Probably they will stay in for the rush and then get out. Reduced margins might eliminate some distributors, but I believe it will also eliminate throat-cutting practices between competitors of the past. Postwar price levels, discounting inflationary effects, should be comparable to prewar price levels on nationally known products.

If the war ends in Europe first, very likely there will be problems on the West Coast. We haven't thought very much about it but doubt if it will be much different from anywhere else, since the whole nation will feed supplies over all communications routes until total victory is won.

The kilowatt-hour consumption per residential customer did go up in October and November to an average of 1,086, which leads me to think that the estimate in our original report might be low. December, without doubt, will raise the annual average even higher.

We have no definite reason for this increase on which we can lay our finger. However, it seems that the increase can be credited to the war effort. There are many families in which two or more members are working, probably on different shifts, consequently cooking is done at more frequent intervals, lights are used longer hours, radios are played more hours per day and many other reasons that can only be arrived at by guessing. Also, many large homes which formerly housed only one family now have rooms rented out and some have even converted to light housekeeping rooms where two families may be under one house still under one meter.

Regarding postwar planning, we have no definite plans as yet and probably will not have until the war is much nearer a conclusion than at the present. We are studying many problems and preparing material for formulating plans when the time is ripe. We intend to keep our minds open until the end and are not trying to tie ourselves down to any definite plan at the present.—*G. W. Milliken, vice-president in charge of sales.*

Idaho

Idaho Power Co.

FOR a while after the war there will be some new manufacturers' lines introduced. As to new retailers, there will be expanded retailing by tire companies and chain stores. We expect no special problems should the war in Europe end first nor would reduction in margins have much effect. Price levels one year after the war may be 15% higher and within two years after the war 10% lower.

As to our advertising, the radio time has been increased by adding home service presentations to partly compensate for the decrease in customer contacts. Copy themes for all sales advertising will continue to be conservation, care and use of appliances and service information.

Customer figures for residence and farm are residential farm customers. The average annual kilowatt-hour consumption includes these farm homes. —*R. A. Gale, general sales manager.*

Nevada

Sierra Pacific Power Co.

AFTER the war we hope we do not have a group who will enter the field to try to cash in on the big volume for a year or two, then pull out. We would like to have our regular electrical dealers handle the situation. As to reduced margins, it is impossible to reduce margins much more than before the war from an economic standpoint. Price levels will probably be higher. Should the war end in Europe first, transportation would be taxed to capacity in this area. However, if the manufacturer is permitted to produce appliances at all, there will be a fair distribution made on an allotment basis.

In respect to appliance repair, we pass the bulk of it to the dealer and we do only minor repairs on which the dealer would lose money.

The high kilowatt-hour increase per domestic consumer over last year is not due to the use of electric heating, at least in this territory. The bulk of our electric heaters are in the Lake Tahoe section and few people could vacation there this year. We do not have war housing projects either so that possibility is eliminated. Rather, we feel it is a combination of many things which caused the increase.

During 1942 the Reno Plan sold nearly 10% of our residential customers a major unit. In 1943, then, is represented a full year's usage of these appliances. Of course, the big reason is that there was less travel this year and that caused more stay-at-home living, resulting in home canning, more cooking, lighting, radio, and the thousand and one little things which go to make up total consumption.—*A. L. Pierce, new business department.*

Oregon

California Oregon Power

DISTRIBUTION of electrical appliances in this district will remain approximately the same. Possibly more furniture dealers will sell appliances. Transportation difficulties are to be expected if the Pacific war continues. Postwar price levels may be higher at first with a gradual reduction. Effect of reduction in margins is not known.

As to appliance service, we maintain a service department in each major town in our territory.—*N. H. Zacharisen, sales manager.*

Eastern Oregon Light & Power

OUR annual kilowatt-hour consumption per residence customer for 1943 is 1,413. This is a gain over last year of 108. We still have a loss of customers due to their moving to defense centers.

As to postwar conditions, more hardware and furniture dealers and plumbers will enter the appliance field. Special problems are to be expected for this area should the war in Europe end first. Prices will be higher for two or three years.—*L. G. Gray, division manager.*

Eugene Water Board

WE have no guess as to postwar price levels. Supply, demand, ability to buy, and inflation will determine price levels. Probably prices will be higher.

We do no merchandising and gather no statistics from dealers, therefore have no basis for estimates. Neither do we have a "new business" department. —*J. W. McArthur, general superintendent.*

Mountain States Power

MEN who have heretofore been in other fields, we find are considering the appliance field. These include sports goods stores and others. As to margins, most dealers consider most margins of prewar not enough or that a reduction in margins would tend to

keep the small merchant out of business. We believe this would not be good. As to price levels, lower prices for standard merchandise can be expected as soon as good volume is again reached.

While we have no estimate or probable volume we expect a very substantial increase in sales. Obsolescence alone will make for a large market.—*H. E. Farris, new business manager.*

Northwestern Electric

MANY of the questions pertaining to postwar period are rather difficult to answer and probably our guess is as far wrong as the next individual who might undertake to make such answers. However, we do not look for much change in distribution nor do we anticipate any new types to enter the field. Reduced margins would reduce the number of dealers. Our guess as to postwar price levels is that they will be higher. If the war ends in Europe first, great congestion may result in slowing down of shipments out West.

Plankinton

We have made the following study of market conditions and present saturation. These figures speak for themselves.

Electric Range and Electric Water Heater Saturation Data

Number of residential and farm customers, Oct. 1, 1943	41,563
Number of electric ranges on lines, Oct. 1, 1943	19,142
Percentage of saturation	46
Approximate number of ranges in use over 15 years and less than 25 years	7,200
Estimated replacements in 1944 due to long wear and inability to get parts due to age	1,900
Estimated requirements for new homes in 1944	729
Total estimated minimum requirements for 1944 for area served by Northwestern Electric Co.	2,629
Number of electric water heaters on lines, Oct. 1, 1943	5,262
Estimated replacements in 1944 due to general deterioration	250
Estimated requirements for new homes in 1944	200
Total estimated requirements for 1944 in electric water heaters for area served by Northwestern Electric Co.	450

Most of the electric ranges in use have been installed in the past 15 years. There have been very few homes built in the past 10 years that have not installed electric range wiring, even though the home owner did not contemplate electric cooking immediately. They were informed by electric contractors that the cost at the time of construction would be very low and that it would give them a higher market value for the property should they want to sell.

Surveys of cooking installations in new homes in the past five years show that electric range installations have run 82 to 85% of the annual total. These data briefly indicate to anyone that electric service in the Northwest is exceptionally popular for domestic use. This holds true particularly in such major service as electric cooking and electric refrigeration, with a growing demand for electric hot water service.

The figures listed below give the consumption and cost of electrical energy for Portland residences having Northwestern Electric Co. service, and also the average for the United States.

Year	Average Consumption Portland	Average Consumption United States
1943	3,086	....
1942	2,437	1,022
1941	1,700	986
1940	1,528	952
1939	1,442	897
1938	1,378	853

Year	Average Cost Per Kwh. Portland	Average Cost Per Kwh. United States
1943	1.73c	....
1942	1.95c	3.67c
1941	2.04c	3.73c
1940	2.11c	3.84c
1939	2.45c	4.00c
1938	2.49c	4.14c

The cost of electricity has been cut from 2.49 cents per kilowatt-hour in 1938 to 1.73 cents in 1943 due to the increased demands of our customers. The average monthly consumption of electricity for an electric range is 125 kwh. At the present rate of 1.73 cents, this makes a monthly cost of $2.16.

In the case of the wood and coal range, the costs of both wood and coal have increased yearly with the present average running from $2.50 to $4 per month. In many cases, coal must be transported long distances, necessitating the use of railroad transportation badly needed for the war effort. Locally, not only for coal but for wood deliveries, there is the waste of local transportation, gas and rubber, to say nothing of man-hours, which are so vitally needed in the war industries at the present time. When these points are considered, there can be no comparison between the cost of the electric range for cooking purposes, where there is an abundance of electrical energy on hand, and the rising costs of the wood and coal range.

In anticipating the postwar sales, a smaller market has been estimated for the first year because of the likelihood of a shortage of appliance stock due to the time required for conversion and the scarcity of materials.

Postwar Market Expressed in Percentage of Prewar Year 1940

Appliance	Probable Number on Northwestern Lines 1st year	2nd, 3rd, 4th and 5th years
Electric Ranges	75%	150%
" Refrigerators	50%	125%
" Washers	75%	150%
" Water Heaters	75%	150%
" Radios	50%	125%

The population increase in the Portland area, i.e., Multnomah County, has been approximately 100,000 above a figure of 355,099 in 1940. The number of these new residents who will remain is problematical. It is known that a high percentage (50% to 60%) of the newcomers to the shipbuilding and other war industries of this area came from other localities in Oregon and Washington, and many of them will return to their former places of residence following the war. Particularly will this be true if conditions should develop an oversupply of manpower following the war.—*J. C. Plankinton, assistant general manager.*

Pacific Power & Light

MANY new retail outlets are likely to be established, in our opinion, in the postwar period. Among those entering the appliance field will be exclusive appliance stores, music stores, department stores, hardware and furniture stores, etc.

Leonard

Reduction in margins would discourage distribution and reduce sales volume. Our guess is that prices will be about the same after they become stabilized.

Our own plans are still in the formative stage and with limited staff the information requested in the questionnaire is not available.—*D. B. Leonard, commercial manager.*

Portland General Electric Co.

POSSIBLY some additional chain store organizations, similar to Firestone and Western Auto Supply stores, will enter the distribution picture after the war. Reduction in margins would have no effect on factory branch distributors but, if margins were cut drastically, some independent distributors might be forced out of business. Price levels should be slightly higher until such time as prewar production levels are established, then prices should be at about prewar levels.

War ending in Europe first would cause a serious transportation bottleneck.

While our postwar dealer program is not definite, we have no intention of returning to the merchandise field which we abandoned in 1938. We believe that as there has been only a 25% shrinkage in dealer outlets and as our contacts show that stores formerly merchandising electric ranges, water heaters and other appliances are eagerly waiting to get back into this field, our postwar program will no doubt be very similar to the dealer promotion program followed before the manufacture of these appliances was stopped.

We will probably need about the same type and number of persons to handle our dealer promotion as in the prewar era.

While we have not made any very definite study of the postwar market conditions, we do know that at least 20% of the electric ranges installed and in service prior to 1928 are badly in need of replacement. In other words, it will require 3,000 to 4,000 ranges a year simply to take care of electric ranges which are beyond further repair. In 1941, dealers sold nearly 9,000 ranges to our customers and, had conditions remained normal in 1942, we feel that 1942 sales would have been at least 35% greater than in 1941.

We feel that automatic storage type electric water heating is now accepted in this area, and that water heater sales would have been 50% or more above 1941 sales. There is no question but what there will be a heavy replacement market for refrigerators and radios, partly due to obsolescence and partly due in the case of refrigerators to the fact that frozen foods will be nationally distributed, and home owners will have to have refrigerators with frozen food compartments or separate frozen food containers, which will create an entirely new market. Many changes in radios will, of course, make obsolete a large percentage of existing sets.

We believe that the postwar era will provide a very wonderful market for the promotion of commercial, industrial and street lighting. The war activity has done more to make commercial and industrial customers conscious of the necessity of good lighting than all of the previous efforts of our lighting engineers. This is also true of street lighting because since we have been in the dimout area, city officials are very much alive to the fact that good street lighting prevents accidents and crime.

While we have never promoted red seal wiring campaigns or similar activity, our residential sales representatives have always worked very closely with builders and architects, and partly due to this and partly to the rather unusual minimum wiring requirements of our city electrical code, the standards of residential wiring in this area are quite high. The same thing applies to a degree in wiring of commercial structures.

We have always maintained a commercial cooking and heating sales organization working very closely with kitchen supply houses, and we have every reason to believe that this will be one of the fastest developing loads in postwar times. We intend to increase the personnel in this field.

McMicken

Our advertising program for 1944 is going to depend very largely upon whether or not electrical appliances, satisfactory commercial and industrial lighting units and other current-consuming materials are in production and distribution. If they are, we will do all we can to encourage their sale and use through advertising. If not, our advertising program for 1944 will be largely institutional and educational.

The average kilowatt-hour consumption per domestic customer for 1943 was 2,218 as against 1,935 for the year 1942, or an increase of 283 kwh. per domestic customer or 14.6%. It is rather hard to account for this increase in residential consumption in view of the fact that electric ranges, water heaters, refrigerators, laundry equipment, etc. have not been in production since the spring of 1942.

We do not have figures for the system as a whole, but in the Portland area, we know of the installation by dealers and by building contractors (who had purchased warehouse stocks for future use) of 1,975 electric ranges and 1,072 electric water heaters. In 1942, dealers sold in Portland 4,024 ranges and 2,315 water heaters. A good many of these were sold in the latter part of 1942, and of course affected consumption figures for the year 1943. We also find that a great many electric ranges have been brought to Portland by people coming here from other points in Oregon and from the states of Washington, Idaho and Montana to take employment in war industries.

Another factor, no doubt, is that due to increased incomes, residential customers are not as careful in the use of energy as in the past. Still another factor is that customers bought every available electric space heater when the government began talking about fuel oil and other fuel shortages in this area, and no doubt these space heaters have had an effect on the residential consumptions of energy.

I might explain to you that we serve a very large number of FPHA housing projects—in fact these projects total something over 19,000 dwelling units, but they do not appear in our residential statistics as, in every instance, these projects have their own electrical distribution systems and we deliver energy to them at primary voltage and under commercial rates; therefore, these consumptions and revenues appear in the commercial and industrial and not the residential classification. In addition, of course, there has been construction of a very large number of court apartments and single family dwellings by private builders under FHA rules which has accounted in great measure for the increase in number of residential customers.—*A. C. McMicken, general sales manager.*

Texas

El Paso Electric

SOME exclusive electric and others carrying electric as a side line will be new types of retailers after the war. We anticipate price levels to be about equal for several years with a gradual lowering of prices about the third year. —*B. K. Banner, merchandise manager.*

Utah

Utah Power & Light Co.

A TREND toward larger distribution through chain stores, department stores, etc., is expected after the war. New chain organizations, such as Firestone, Goodyear, etc., will probably enter the field. If margins are reduced more of the business will stay in the present method of distribution, through jobbers. Our guess as to postwar price levels is that they will be somewhat lower.

The figures reported in the tables cover Utah Power & Light Co. and its subsidiary, The Western Colorado Power Co. Unit sales are for dealer sales only, as the company does not sell merchandise. We have supplied combined figures for residential and farm classifications in all instances. Our accounting procedure does not segregate the two and, hence, the total figure only is available.

As to the considerable increase in kilowatt-hour consumption by domestic customers over 1942, our only ex-

Huckins

planation is that during the past year more money has been available to our customers. Also because of our housing shortage, many families have doubled up in homes and consequently more electricity is used. Shiftwork, too, has been a contributing factor, since it requires cooking of meals at odd hours, as well as burning of lights. These factors, we believe, account for this rather large increase in average domestic consumption during 1943.

We have been giving considerable thought to postwar planning and have submitted tentative plans to our management, which have not as yet, however, been cleared.—*W. A. Huckins, sales manager.*

Uintah Power & Light Co.

LOOKING forward to the postwar, in the area served by this company the demand will be greater after the war than it was before. Reduction in margins would have very little effect. Price levels should be somewhere about the same or 10 to 20% higher.

We plan to increase sales effort in the lighting fields. We have not had any work done in any of these fields. After the war we are making preparations to have a sales force for them.

Neither has the territory had any attention paid to the subject of adequate wiring throughout the years. We plan an extensive advertising program and educational work.

Figures reported in the chart are made strictly from estimates. We do not have dealer reports and do not have anyone in our organization who has been qualified to contact the dealers in this area for the past two years. We have our plans all set to put this type of work into operation shortly after the close of the war.

Realizing the need for this work, the company will be in a position after the war to do more. We have more or less sat back and tried to get the dealers to do the sales work. After long years of trying, we are now in a position to receive the badly needed benefits of a well-planned sales program.—*V. A. Bair, secretary-general manager.*

Washington

Puget Sound Power & Light

OUR postwar planning is not at this time far enough along to give any definite answer and probably will not be that far along until the spring. In other instances we no longer keep records and cannot give figures and probably will not be keeping those records until after the war.

Hess

In the postwar situation there will probably be more exclusive electric merchandise stores in our opinion. Reduction in margins would reduce the number of outlets materially and department and furniture stores would probably be the main outlets. Our guess as to postwar prices is that they would be approximately 20% higher.

As to load changes, no data are available but, apparently, our daytime load has increased about 25,000 kw. over a year ago. The system peak has swung back to 5 to 6 p.m. with the relaxation of restrictions on display lighting.—*C. E. Hess, utilization manager.*

City of Seattle

DURING the year there were four noteworthy trends regarding use of electric energy.

1. Further decline in commercial lighting due to restrictions and dimout regulations. However this loss was more than compensated by increased use in defense housing and Army and Navy projects.

2. Increased interest in commercial electric cooking equipment.

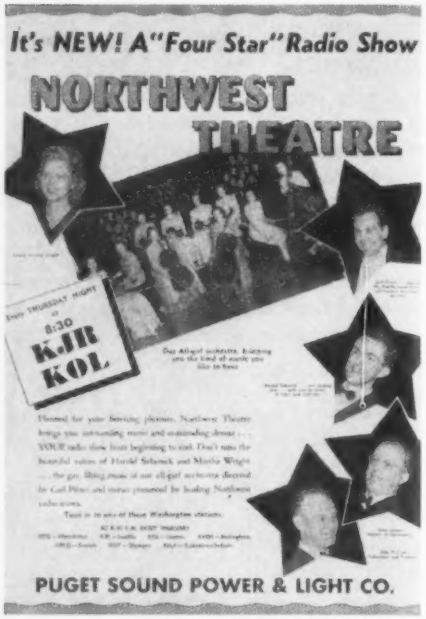
3. Continued demand for large blocks of industrial power. The increase in kilowatt-hours during the year was 21.29%.

4. Greater use and wide acceptance, both residence and commercial, of automatic electric hot water tanks. It is interesting to anticipate the future use of electricity for water heating purposes. Under our residence all-electric rate schedule there are over 17,000 customers who use an average of 4,000 kwh. per year, each for water heating only. The value of this all-electric rate has definitely been determined as evidenced by the following growth:

In July 1940, the year the all-electric rate was made effective, our average annual kilowatt-hours per residence customer per year was 1,703 kwh. In 1941 the average was 2,062 kwh., in 1942 the average was 2,612 kwh. and in 1943 the average was 2,994 kwh. These successive annual increases are due to the large volume of automatic electric hot water tank installations. The importance of automatic electric water heating can probably best be shown by the increase of our annual revenue per residence customer of $35.93 in 1940 to $38.58 in 1941, $44.45 in 1942 and an estimate of $48 in 1943.

The above residence kilowatt-hours and revenue do not include any master metering.

Our postwar plans are concerned with the greatest use of labor and materials for load building through elec-



Puget Sound Power & Light recently introduced a radio show as part of its institutional advertising program

Tacoma Light's range shop. Pictured are Mildred Wilson, clerk; J. M. Powers, department supervisor; Ed Faker, storekeeper, Carl Ostland, foreman

tric range and automatic electric hot water and commercial cooking installations.

A large new and replacement market will bring new brands into this area and create many new dealers after the war. National concerns maintaining house canvassing sales organizations may sell electric appliances; also many chain store outlets. Reduction in margins would eliminate the small dealer on account of short margins. Prices will be about the prices of the year of 1941 plus 20%. Ending of the war in Europe first would affect the Pacific area by uncertain shipment dates due to the use of railroads by the military.

Our studies in postwar planning indicate that, due to restrictions of wiring material and merchandise, many of our new homes were not wired for electric ranges or water heaters. We expect an electric range replacement market on City Light lines of 8,000 ranges per year and a new market of 3,000 electric ranges; automatic electric tank water heaters, a total of 6,000 per year.—*P. C. Spowart, sales manager.*

City of Tacoma

POSTWAR will see many new electrical dealers. Many of these will be looking for a quick-profit, no-service type of business. Reduction in margins would have an uncertain effect. We expect to see higher prices on all appliances. Special distribution problems in the Pacific area should the war in Europe end first would be due to curtailing of gasoline and tires.

In the commercial cooking field we plan to promote actively sales of heavy-duty equipment, both for replacement of obsolete and worn equipment and for new installations.

In 1944 we will continue to use the Edison Hotpoint Bond selling program as originally started early in 1943. This has been supplemented with billboard and newspaper ads, advertising the Electric Kitchen of Tomorrow with the War Bond purchase of today.

We believe dealers should be contacted now to formulate a plan to eliminate the trade-in problem when new merchandise is available.

The increase in kwh. per residence customer is probably due to increased use of electricity for house heating, as a result of the fuel shortage, and to the renting of spare rooms for sleeping and light housekeeping purposes as a result of the housing shortage.

Losses to military and to defense industries were not replaced in our sales force and sales activities are at a temporary stand-still for the duration.—*J. Miles Power, sales manager.*

Washington Water Power

JUDGED by dollar and cents value, a used appliance exchange and sales service may not be worth much to the utility. Customers, however, seem to appreciate the company's helping hand.

The Washington Water Power Co. started its used appliance service the first of December 1943, and advertised it as the Reddy Kilowatt Trading Post. Prior to this time, back in 1942, a survey was made of residential customers to learn if they were willing to dispose of unused appliances for the benefit of war workers — 5,888 appliances came to light, with the electric iron heading the list, followed by washers, toasters, percolators, etc.

The company's method of handling these used appliance sales is simplicity itself. Customers are to bring in items in good working order, set their own selling price and receive a claim check. The company displays the merchandise on the sales floor and advertises the display in a general sort of way. Purchasers coming in pay cash for the items of their choice, receive a tag bearing the original owner's name in case the transaction requires future adjustment. Money collected is transmitted to the original owner, and the transaction is closed.

Tool

Occasionally, customers submit useless merchandise for sale, but not often. Now and then a customer will attempt to profiteer on the war situation by charging too much, but prices usually adjust themselves. The stock of merchandise has a daily turnover, and the average stock on hand never exceeds 20 pieces.

Because of war conditions, the 5,888 pieces of electrical merchandise, unearthed by the 1942 survey, never materialized. People decided to hold on to what they possessed. However, the first's month effort has resulted in 260 items sold in one city alone with hand irons leading the list, followed by toasters, waffle irons, air heaters and hotplates. Twenty calls came in for every piece of merchandise that was sold, and when the newspaper hinted that war requirements would permit the manufacture of two million hand irons for public consumption, the Trading Post was flooded with old irons.

Dealers favor the exchange because it helps keep alive the idea of electrical merchandise. Buyers are invariably pleased. "No one but the Water Power would think of a thing like that," said one customer, who did not know that other companies have originated a similar service. Happy housewives phone in to express appreciation for their newly obtained merchandise.

McElroy

Much credit for good will is traceable to the men in charge of the Trading Post. For example in Spokane, years of merchandising experience taught Clarence Galloway, formerly dealer coordinator for the company, how to change the worried face of a would-be entrepreneur into a wreath of smiles. No attention is too small for him to follow, no problem too great, and the sincerity of his effort was soon whispered around. Unquestionably the 260 purchasers have a more kindly feeling for the company, and from the standpoint of advertising, many additional thousands are told that their electric company, with no selfish motive involved, desires to help them and also help the war effort.

Creation of the idea came from R. B. McElroy, general sales manager, who discussed it at the Northwest Electric Light & Power Assn. Utilization Section meeting. Frank Tool, manager of residential and farm sales, developed it to apply to all division and district offices on The Washington Water Power Co. system.

Hawaii

Hawaiian Electric Co., Ltd.

LOOKING forward to postwar conditions, we see an increased number of distributors, dealers and direct manufacturer-to-consumer selling. As to retailers, many not formerly in electric appliance business, including jewelers, will probably enter the field.

As to special distribution problems, should the war in Europe end first, we feel that this is *one* war and should be considered as such.

Reduction of profit margins would ruin specialty selling organizations, reduce standards of appliance dealers and sales people, and tend toward worth-while organizations not being interested in the electric appliance field.

In respect to some other questions, the estimates of probable volume for the five postwar years in percent of five prewar years given in our case represent increases for the total five-year period.

As to service, we give a 100% serv-

ice on lines handled by ourselves and render service where the dealer is unable to furnish it. Otherwise, the dealer and distributor furnish their own service on their own products.

We plan a radio program for the enjoyment of our customers, using a minimum of commercials, if any.—*C. P. Nolan, sales manager.*

Canada

B.C. Electric Railway, Victoria

IT will be observed that with regard to postwar planning our activities will be in line with those of our main office branch at Vancouver, B. C., and we would, therefore, refer to the data from that office. As to merchandising sales during 1942 and the current year, we have been unable to obtain the necessary information due to a lack of staff.

We look for few changes in distribution after the war. Electric dealers generally have taken on a diversity of other lines and may be expected to attempt to retain such lines.

As to special Pacific area problems, those which arise due to wartime increase in population and consequently higher purchasing power will continue as against a decrease of them in the eastern part of Canada. Rumored reduction in margins would make dealers revise their ideas as to what is the procedure to use in selling. That is, they would have to decide whether specialist salesmen or across the counter sales would be necessary. We are unable to make any estimates as to price levels.—*E. N. Horsey, manager, light and power department.*

B.C. Electric Railway, Vancouver

PRESENT manufacturers will foster fewer and better dealers, in the postwar period. New manufacturers will have to develop some additional outlets. Present dealers will keep diversified non-electric lines.

Some additional specialty dealers will go into business. Auto accessory chain stores will become a factor. There may be a tendency for new manufacturers to open direct dealer outlets.

Should the war in Europe end first, the area west of the Rockies may be on a semi-war basis when the rest of Canada is returning to normal conditions.

As to postwar price levels compared to prewar, in Canada the tariff situation is always an important factor in the price of durable goods, both imported and Canadian made. We would think that after the 25% excise tax is removed prices will be 10% to 15% lower than prewar.

We are making a 10% sample test of urban customers as a study of postwar market conditions.

Walker

Other data regarding the company's operations are to be found in the tables. The average annual kilowatt-hour consumption per residence customer, however, makes no allowance for the effect of one month's free energy which was given in lieu of a rate reduction. The customers include rural customers but exclude the flat rate water heaters. —*Edmund E. Walker, light and power sales manager.*

Leagues Also Plan For Future

B. C. Service League

AS a part of our postwar planning, the Electrical Service League of British Columbia, of Vancouver, B. C., has just issued a folder to be sent to builders, loan companies and some of the real estate people to interest them in adequate wiring and electric service. The folder already is in the hands of most of our good builders in this district; has received very favorable comment. While they have used the services of the league to some extent in the past, I do not think until they had a complete folio of our activities they realized to what extent the electrical industry was prepared to assist them in supplying information having to do with electrical installations of the buildings they are erecting.

The league has had a very successful year in spite of restrictions and regulations placed on the industry. Residence building in the area has been quite good, although much difficulty has been experienced in procuring labor and materials.

In our industrial and commercial lighting we have continued to give advice and plan service to a large number of industrial plants concerned with production of war materials. As chairman of the IES advisory committee on dimout and blackout regulations in the area, I have cooperated with the authorities and with building owners and managers to bring about supplies.

As with everyone else, we are at present studying postwar plans and have set up a number of committees to bring in reports. These committees to date have not progressed to any length but with a brighter picture of the war generally there will be undoubtedly tremendous activity amongst them.—*R. Hall, lighting director.*

RMEL

WHILE still clinging to the battle front upon which it has taken part in practically all activities of the nation's various war agencies and its armed forces, the Rocky Mountain Electrical League is now also mustering its strength for peacetime occupation of the operating, engineering and sales sectors and a half dozen salients heretofore neglected. Blueprints for the league's retooling process were inked in at its Feb. 4-5 meeting, in Denver, from preliminary drafts upon which half a dozen committees had worked since early winter.

Deliberations during the two-day conference, at which President C. C. Baker presided, encompassed more than a score of subjects. The league's recently formed new projects committee provided the channel through which most of the discussion and planning was routed. Those comprising this important new unit of the league are: F. F. McCammon, vice-president, Public Service Co. of Colorado, Denver; W. N. Clark, president, Southern Colorado Power Co., Pueblo; L. R. Storey, vice-president, Home Gas & Electric Co., Greeley; J. A. Bullock, vice-president, Western Colorado Power Co., Montrose; W. D. Johnston, manager, Mountain States Power Co., Casper, Wyo., and E. T. Tengdin, Inland Utilities Co., Espanola, N. M.

Operating problems of the future were so numerous and discussion-provoking that it was impossible for L. W. Edwards, Mountain States Power Co., Casper, chairman of the Engineering division, to dispose of more than half of the program that he and his associates had prepared for the occasion. Postwar sales and promotion activities, which during 1944 will be directed by H. T. Rankin, Public Service Co. of Colorado, Denver, also claimed serious consideration, from the standpoint of utility, dealer, distributor, manufacturer and contractor. The Accounting division, under the leadership of W. J. Benning, Southern Colorado Power Co., Pueblo, also registered in with a program pointed toward solution of innumerable problems that will present themselves in this field after the war.

Disconcerting to all those present at the conference, representative of four states, was the problem of the disposition of hundreds of thousands of dollars of electric equipment now reposing in government warehouses through-

out the area. This material has been salvaged from abandoned or constricted war agencies and projects. The ugly head of the sniping speculator already has risen in the Rocky Mountain region, giving much concern to established distributors and manufacturers whose businesses will be badly damaged if surplus war materials are thrown indiscriminately upon the market. A major objective of the league is to promote an orderly, controlled distribution of surplus goods, preferably through national administration, efforts to this end already having been taken by the league.

To carry out its broad after-the-war program, as well as to finish current activities relating to the war effort, the league during January made provision for functioning on behalf of the industry upon a vastly expanded scale. In this respect, the league has taken into consideration the re-employment of service men, resumption of dealer and utility company appliance sales, protection against undue restrictive measures, unjustified competition and the elimination of factors that will retard full postwar progress and expansion.

The league emerged from 1943 with a proud record of achievement on behalf of its membership, as well as the public. During the year, the organization provided more concrete services on behalf of its membership, upon request and voluntarily, than in any previous like period. It also responded to public demands for assistance with respect to appliance repairs and similar needs on a wider scale than ever before.

In furtherance of the war program, the league met every challenge for cooperation and assistance. Its officers and members took leading roles in conducting War Bond campaigns, Red Cross drives, salvage and surplus material recovery and distribution and similar undertakings. In pursuing its salvage, Red Cross and Bond sales programs, the league established War Service Centers, mostly on now empty sales floors of the utilities.

As evidence of the league's widespread aid to federal agencies and their numerous units, military bodies and patriotic organizations, records in its headquarters' files disclose that it has collaborated with the following: The Army, the Navy, War Production Board, Office of Price Administration, American Legion, American Red Cross, Defense Council, American Women's Volunteer Services, Colorado Vocational Training School, Office of War Utilities and Denver Opportunity School.

League funds, originally destined for maintenance of the organization during the current period of reduced income from membership, and for postwar use, have been diverted to the more pressing needs of the hour—War Bond purchases. The membership in each of the states served by the league earmarked dues for this express purpose.

The American Red Cross and similar organizations also have been beneficiaries of the league's finances, formerly utilized for merchandise sales promotion and other purposes of the association.

In common with similar organizations that are planning for postwar effort, the league has completed several plans for cooperating in various industry endeavors. It will participate in the Edison Institute's national program of appliance conservation. It also has made arrangements with other leagues for an exchange of engineering reports and other papers, as has been done in the past.

Lewis

Practically all league member companies are utilizing the advertising copy prepared at headquarters. Because of the demand for this copy, it is the plan to continue, and if necessary, expand this service during the coming year.

There will not be a month during 1944 but what one or more units of the league will meet to pursue their particular activities. President Baker has scheduled a program for the year that will tax the personnel of various divisions, sections and committees. Because of the scope of the league's endeavors and the expected results therefrom, it is likely that an all-industry conference or convention will be found necessary, some time in the late fall. —*George Lewis, managing director*

Inland Empire Assn.

REPORTING for the Inland Empire Electrical Equipment Assn., I will say that the association has lain dormant insofar as activities are concerned during the year 1943. As you know, this association functions as individual units in each of our divisions and the distance between towns in most of the divisions is so great that it was decided to have no meetings during the year on account of transportation facilities.

Each of our sales managers also functions as secretary of the divisional association and calls on those dealers in the division who are still in business about once a month. He discusses with them the many priority regulations and assists them in correct interpretation. Between his visits our local managers are in a position to render dealer assistance if it becomes necessary.

One place where we have been extremely successful in rendering assistance has been the work we have been able to do in securing appliance repair parts for dealers. In the Spokane area, where there is considerable war housing, we have been rendering a very valuable service in assisting dealers in all the necessary forms required for ranges, water heating, refrigerators and building wiring.

So while we have found it impracticable to have association meetings, our representatives have rendered considerable personalized services.

The same officers were continued in office, and as I meet them from time to time they all suggest the possibility of a meeting. They really admit that they miss the good old meetings that we had in the past. That is worth all the effort we put into the association. When the war is over there isn't any question in my mind but what we shall revive the association on a bigger and better program.—*R. B. McElroy, secretary.*

Northern California Bureau

THE Northern California Electrical Bureau went on a wartime basis in 1943 and curtailed all expenses as much as possible. Our efforts have been directed primarily toward keeping the bureau organization intact and on as economical a basis as possible. We have felt that now when practically all of the material used in electrical apparatus and equipment is critical material, any intensive promotional activity would certainly be out of order and even unpatriotic. Therefore, 1943 promotional efforts were sharply curtailed and confined primarily to educational work. This has included schools for service repairmen, classes for store lighting personnel, contacts with school authorities on school lighting investigation and, of course, the important radio interference work. A brief summary of these activities is included in the current issue of *Bureau-Gram.*

It is not our intention to increase this promotional effort during the first half of 1944, but to continue about as we have in 1943. If the anticipated improvement in the war effort permits some increase in the production of durable goods during the latter part of the year, some promotional effort may be desirable then. As that time approaches we should be ready with funds in the treasury and with plans made to proceed right away.

The merger of the Electric Appliance Society and the Pacific Radio Institute with the bureau and the subse-

quent reorganization of the new bureau have given the electrical industry in northern California one vehicle through which all promotional efforts may be coordinated. Five sections, each under the direction of interested industry leaders, have been provided in order that no one phase of the industry would be neglected. There is a lighting section to stimulate postwar lighting standards and new equipment; a wiring section which will undoubtedly be the headquarters for the adequate wiring program in this area; an appliance section to stimulate the market for appliances when that becomes necessary; a radio section which has the opportunity of being a big factor in the postwar introduction of many of the marvellous developments made in radio transmission and reception during the war period, and also in directing the radio interference activity; and finally an educational section whose function it will be to assist in organizing training facilities for the industry. Specific and detailed programs in any one section can now be formulated and quickly executed through local units of the bureau. Three units were organized during 1943, one in Oakland, one in Sacramento, and one in San Francisco.—*B. W. Reynolds, chairman, executive committee.*

PCEA

DURING the past year, the primary efforts of the Pacific Coast Electrical Assn. have been to serve the industry in meeting the current problems growing out of the wartime program and restrictions. This has been done through the medium of:

1. The spring and fall conferences in San Francisco and Los Angeles which were reported in detail as they occurred and which provided an opportunity for the discussion of problems and the interchange of ideas.

2. Meetings with the dealer groups to advise with them on appliance maintenance and repair, to keep them posted on the constantly changing WPB and OPA regulations and assist them in obtaining the necessary parts and manpower to continue in business.

3. A course in appliance repair to create a source of trained manpower to meet the dealers' needs.

4. Regular mailings to all electrical inspectors in the state, giving them in file card form all interim revisions to the National Electrical Code and interpreting for them the effect of these revisions on local wiring regulations.

5. Preparation of a model form of ordinance for adoption by cities in order to bring their present wiring regulations into line with WPB restrictions.

6. The continuous efforts of several committees to formulate plans and to take all steps possible at the present time toward paving the way for an orderly transition to peacetime activities.

Among these latter activities, special mention should be made of:

a. The aggressive promotion of the ordinance prohibiting the sale of unsafe electrical appliances which has now been adopted in 32 cities and is up for consideration by the city councils in as many more communities. In addition to the 32 by which it has been adopted, there are 14 cities which have on their statute books laws that, while not identical with the one now being promoted, are directed toward the same objective.

Hartley

b. The continued promotion of the Uniform Electrical Code which permits any wiring method approved under the National Electrical Code. This assures the customer a maximum wiring job for the amount expended by eliminating the many costly restrictive provisions often found in local ordinances; and further simplifies the wiring problem by the establishment of uniform requirements. This ordinance is now in effect in 73 California cities.

c. The establishment of a close tie-in with home financing agencies toward the end that when home building is resumed they will recognize the value of better wiring and require more adequate jobs in the homes which they finance. As an outgrowth of this, a series of home-planning institutes has been launched at which groups of prospective home owners are being instructed in all details of home planning —selection of site, financing, designing, building, wiring, etc.

d. Studies of the possibility of achieving many standardized practices in the industry which will simplify problems of maintenance and repair without restricting the full exercise of individual enterprise and ingenuity.

e. The plans of the highway lighting committee to direct the attention of the proper state officials to the importance of illumination as a safety factor in order that proper highway lighting shall be incorporated in the postwar highway projects that are now being designed.

f. The work of the planning committee which has not only instigated many of the projects now being executed in detail by other committees, but has also acted as a clearinghouse for the dissemination to the member companies of information designed to assist them in preparing to meet their postwar problems.—*Victor W. Hartley, managing director.*

San Diego Bureau

IN three fields of activity the Bureau of Radio and Electrical Appliances of San Diego County continued to work in the interest of the industry at large during 1943 and will carry on in much the same lines in 1944. Rather complete reports have appeared in ELECTRICAL WEST of these activities, so a summary of some of the highlights will suffice here.

First the need for a greatly increased service to clear the edicts, mandates, orders and regulations of the many governmental bodies controlling us was apparent. We had already learned that these agencies take no responsibility for informing our members individually of either limitations or restrictions or the opportunities for meeting them so it seemed our clear duty to do this.

Second, with electrical appliances virtually disappearing, a need developed for increased emphasis on activities that might help members maintain service facilities and assist their customers in the care and use of home equipment.

Third, advertising expenditures of the bureau, from the budget made available by the San Diego Gas & Electric Co., reached a new peak, largely because of tremendous emphasis on the theme of appliance care and use.

To touch upon some of the highlights of the year, first mention must be made of the distribution of the booklet *War Timely Guide* in cooperation with the block plan of civilian defense and subsequent lecture classes. A refrigeration training class started in February under joint sponsorship with the vocational school. In April a second refrigeration training course was started and a survey of radio tube shortages in the area was conducted. Range and refrigerator meetings for dealers were held in May to review priority selling methods and prepare for the stove rationing program. The Appliance Repair Directory was revised and reprinted in June. In July a washer need survey was conducted to present to congressmen, and the unsafe appliance ordinance was sponsored in all incorporated county towns. The stove rationing program got under way in August and in September a permanent committee was set up to recommend ways and means to simplify manufacturers' guarantees and warranties. In October the program

to unearth idle appliances was worked out cooperatively with Goodwill Industries and in November the annual bureau conference was held. In between these events constant alertness was maintained on all government bulletins and regulations and committees were set up to deal with various problems brought about by them.

In looking forward to 1944 this is our view of the general outlook.

Manpower will continue to be the top problem despite proposed increased ceilings for essential service work and higher priority on all types of essential service personnel. Even these measures will not enable us to cope adequately with the much expanded demands for appliance service. An added year of life will inevitably mean much greater service per unit than was required last year.

Parts and supplies for service and repair will become less difficult to obtain. By midyear this should be no problem. Even radio tube production should expand sufficiently to relieve current pressure by July 1.

Despite present confused statements and contradictions, we believe that electric irons will be produced in sizable quantities beginning not later than April and washer production in reasonable quantities not later than June. Refrigerators will again be made, we believe, soon after midyear. We are convinced, however, that if such production materializes some form of buying control will be established to prevent owners of equipment, unless worn out, from acquiring new models.

Surplus war materials, some electrical, will hit the market with increasing impact. We believe that before the year is out, sizable stocks of electrical appliances and equipment will be found working back from surplus into retail channels. Radio tubes may be included.

Dealer loss in our territory will be very slight. It will be more than offset by former operators scurrying to get back into the business. We predict that the move on the part of newcomers to get into appliance merchandising will become so pronounced by midyear as to present a major problem for manufacturers and distributors. We further predict that the rank and file of our product representatives will favor dealers who have stuck it out over the newcomers who want to get in.

Regulatory measures affecting our industry will continue throughout 1944.

As for 1944, ever since the war our policy has been to gear our programs to the needs as they arise. It would have been impossible for us to do as much for the industry as our record testifies had it been necessary for the earmarking of advertising months in advance or adoption for the year of a program in general. We feel confident that our board of directors, 22 in number, and the advertising committee made up of eight representative men, will continue to keep the bureau on top of our problems as they arise, quickly developing programs from time to time where the need is great.

Our advertising for the immediate future will continue to be geared to the theme of appliance care and repair and building of public appreciation for all types of home appliances and equipment. Remaining supplies of the booklet, *War Timely Guide*, will be distributed to all member organizations for presentation to customers.

There will be continuance of the practice of assisting members to operate as smoothly as possible against the many government rules, regulations, orders and restrictions. Assistance in acquiring and maintaining adequate service personnel will be one of the important activities. Early revision of the Appliance Repair Directory will be undertaken, looking to a re-issue about Feb. 1. Other programs, both tangible and intangible, will be undertaken as the need arises. We have no doubt that 1944 will prove to be the most active year in the history of our bureau.—*J. Clark Chamberlain, secretary-manager.*

Manufacturers Study Postwar Markets

General Electric Supply

FACTORS which electric utilities in Oregon and southern Washington consider important in planning postwar loads were brought out in a survey recently completed by C. A. Boring, General Electric Supply Co. branch manager at Portland. In announcing the results, Boring pointed out that postwar planning is naturally further advanced in districts outside Portland, where shipbuilding and other war industries make wartime problems more immediately pressing.

Postwar loads which those surveyed believe require the most study are: (1) freezing plants; (2) revamped and enlarged street lighting systems; (3) home heating by electricity. Attention is being given also to fluorescent lighting, where big changes are anticipated, particularly in store lighting and in the use of cold and hot cathode. Soil heating also is being studied.

Of the three major problems, the survey indicates that No. 1, freezing plants, takes precedence. This relatively new industry was just getting firmly established when procurement of materials and equipment was restricted. With every locker rented and long waiting lists, a heavy demand for more locker space just to supply local demand is almost sure to come with lifting of restrictions. On top of that is the expected "export" of frozen fruit and vegetables to other sections of the country. Climate, moisture and a long growing season act to produce the finest fruits and vegetables. With air express established on the tonnage scale anticipated, it will be possible to place large quantities of Oregon frozen fruits and vegetables on the New York market, within 24 hours.

Home heating, No. 3, is also coming in for much planning, though for a somewhat longer pull. As a load builder for the utilities, it would, of course, outstrip almost anything else. With the abundant water power in the Northwest region, Boring's survey indicates that it is generally expected that electric house heating is a development that will not be long delayed.

Hotpoint

HOTPOINT, too, made a market study among the utilities of the nation to determine trends, plans and policies in respect to the postwar period. A breakdown of that study as it represents the West has been promised for a later issue of ELECTRICAL WEST.

In brief, however, the national study reveals what this annual questionnaire of ELECTRICAL WEST has also found, that little change in policy or method is expected after the war among the various utilities. The Hotpoint report covers 78% of the domestic meters in the United States, from 286 companies and municipals; 97 straight electric, 127 combination gas and electric, 62 municipal.

Of the total 181, or 63.3%, plan to merchandise, 90, or 31.5%, not, and 15, or 5.2%, did not answer. The majority of merchandising utilities indicated they would sell ranges and water heaters — 97.8% and 95.1% respectively; 83% would sell refrigerators, and among the new possible load builders 37% would sell dishwashers, 7% clothes dryers, 27.2% waste exits, 67% washers, 63% ironers and only 8.7% said they would sell quick-freeze units.

But since these and other totals for the nation may not necessarily be the predominant opinion among Western utilities, the breakdown for the Westerners will be awaited with interest in a later issue. This survey is particularly interesting in that it was personally conducted by Hotpoint men in calls and talks with each utility in the list.

Electronics at Work In Industry—III

Third in a series of articles dealing with the fundamentals of electronic tubes and circuits. Herein is told how the Ignitron has furnished the electronic key to fast, uniform resistance welding

E. W. Morris
Westinghouse Electric & Mfg. Co.
Los Angeles

ELECTRONIC control has made resistance welding a precision process available to all industrial plants. Although primarily used today in aircraft and similar plants to weld stainless steel, brass and nonferrous metals of sharp fusion point, in the future it promises to replace the crude methods of resistance welding used in many automobile and sheet metal plants. In these plants and processes, heat was applied so generously as to cause frequent burning, electrode marking and scaling. Resistance welding under electronic control is a process with a tremendous future.

Resistance welding is employed to fuse metal parts together by passing current through them while under pressure. Materials usually joined in this manner are aluminum, alloys of aluminum, brass, stainless steel and special alloy steels. Resistance welding usually is confined to sheets of these materials, some paper thin, others as heavy as ¼-in. thick.

In order to fuse properly without burning or changing the structure of the material it has been found that heavy currents are required for short lengths of time. Currents may reach 50,000 amp. for ¼-in. material and, on the other hand, a welding time no longer than one-half cycle may be required for very thin sheets.

The heat which causes the metal to fuse is determined by the product of current squared, resistance and time (I^2R x time = watt-hours or kilowatt-hours). Resistance is obtained by clamping the pieces of work together between electrodes, which serve to apply a fixed pressure and conduct heavy current to the point of weld. During successive welds, every effort is made to maintain constant resistance by controlling electrode pressure and the cleanliness of the material. This leaves only two other factors, current and time, which might cause variation in successive welds.

Stepless adjustment of current for various welds up to 180 per minute is provided by this 45-kva. Ignitron controlled a-c spot welder at Industrial Aircraft Co., Los Angeles. Machine is one of a bank of the newest and largest installations on the Pacific Coast

There are two types of electrical energy which can be applied to a resistance weld. One is single-phase a-c, where current from a constant voltage source is allowed to flow through the materials for a fixed time. The other is stored energy, where the source is a reservoir of d-c which is allowed to discharge into the material. The single-phase a-c type will be described first.

Single-Phase A-C Method

Current is determined by the impedance in the welding circuit and the voltage, both of which are held constant within reasonable limits. In switching large amounts of a-c power of short duration and at high speed, it was found that only an electronic device could be dependable, consistent and accurate.

For that reason, the Ignitron was developed in 1931. It answered the need for a device which had an enormous short-time overload capacity, and ability to pass current readily in half-cycle steps. Operation of the Ignitron was described in the preceding article of this series.

When Ignitrons are used to switch single-phase a-c, it is essential for a pair of them to be connected as indicated in the accompanying sketch, such that one tube carries current during one-half cycle, and the other during the reverse half cycle.

The next problem in single-phase a-c resistance welding is to provide a means of energizing the firing circuit for short fixed periods of time which will be accurate on successive welds. Such a device is found in the thyratron, a gas-filled electronic tube with an anode, cathode and a grid. The cathode is of a thermionic, or heated type. This tube acts much like an Ignitron, with the exception that potentials applied to the grid, rather than the ignitor, determine the anode voltage which the gas breaks down and allows electron current to flow between the cathode and anode.

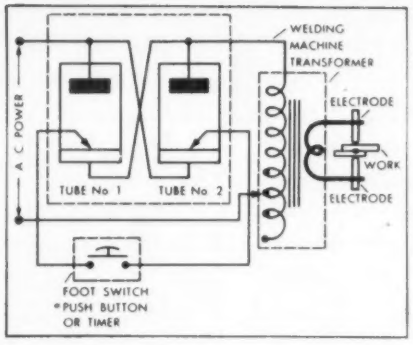
The grid in a gas-filled electronic tube performs very much in the same manner as in a vacuum tube. It is

another electrode usually in the form of a grid or screen interposed between the cathode or anode, and to which either positive or negative potentials are applied. Electrons on their way from cathode to anode must pass through this control grid. If negative potentials are applied to the grid, it reacts to retard the flow of electrons between cathode and anode; but positive potentials on the grid add to positive potentials at the anode to accelerate electron flow. Potentials on the grid are more effective than those on the anode in controlling electron flow, since the grid usually is much nearer the cathode than is the anode. With a-c applied to the anode of a thyratron, the grid may be made to block firing of the tube until some predetermined point on the anode potential is reached.

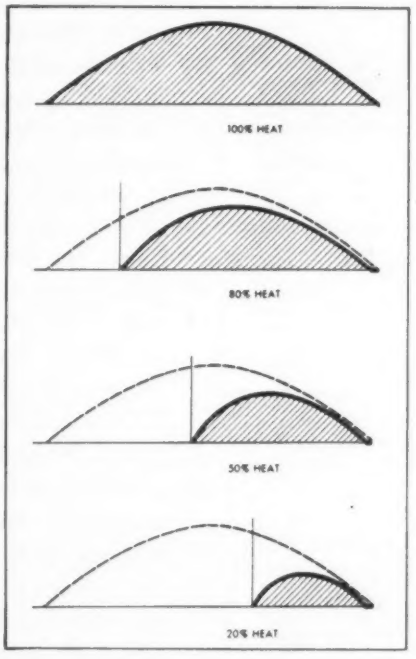
A capacitor with resistor in series can be depended upon to charge or discharge at a predetermined rate which will be consistent on successive operations. The timing device in a resistance welding control is a thyratron, the grid of which is energized from a capacitor and the charging rate varied by an adjustable series resistor.

Another pair of thyratrons, one in the ignitor circuit of each Ignitron, act as relay tubes to energize the ignitors without delay. Ignitrons and thyratrons operate in less than 1/1,000 of a second, once they are given their firing impulse. The Ignitrons are fired through their thyratrons by means of an electronic switch, which simultaneously starts the timing condenser charging. At the end of a time which was predetermined by the series resistor, the timing thyratron energizes and blocks the grids of the thyratrons in the ignitor circuits, thus stopping current flow to the welding transformer. This type of thyratron timing control can be relied upon to be accurate in one-half cycle steps from one-half cycle to thirty cycles, which covers the range of all resistance welding.

Ignitron firing may be delayed on each half cycle, as illustrated by one of the accompanying drawings. This feature, combined with the accurate timing of thyratron control, provides control over two very important factors, time and current, which can be adjusted accurately for each weld. In resistance welding, this variation in the point on the wave where the Ignitrons are fired, is known as heat control, and obviates the necessity of having heavy current taps on the welding transformer. Another feature of electronic control on single-phase a-c resistance welding is that the transformer can always be energized at the proper point on the voltage wave each cycle, to prevent transients and abnormal current peaks.



Above: Two Ignitrons are used to switch single-phase power in a-c resistance welding. Below: Voltage control by delaying ignition point on a-c wave



Stored Energy Systems

All of the preceding discussion has been concerned with single-phase a-c welding where the welding transformer primary current is taken direct from a 220- or 440-volt, a-c line. Since the high reactance welding transformer secondary is short circuited through the material, there is a high kva. demand at low power factor during welds. This demand may last for approximately five cycles during each two or three seconds, which may give noticeable voltage fluctuations.

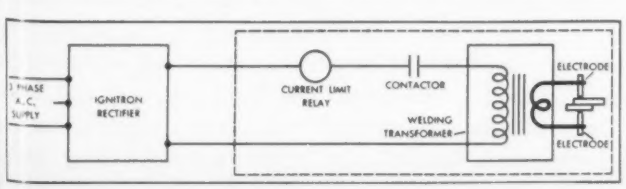
To help reduce this high single-phase kva. demand at low power factor, a new method of resistance welding recently was introduced. It is known as the energy storage system, whereby energy is drawn slowly from a three-phase line and stored until a weld is made.

There are two types of energy storage control for resistance welding: the magnetic type, which stores energy in the iron core of the welding transformer, and the capacitor type, which stores energy in a bank of capacitors. In both types the three-phase a-c is rectified by an electronic rectifier, and the d-c energy is stored.

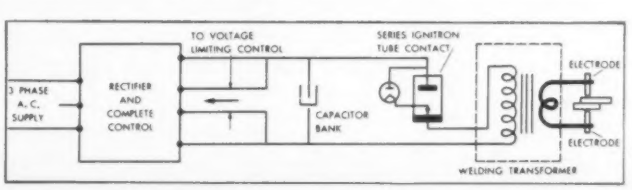
In the magnetic energy storage type illustrated in the accompanying sketch, the welding electrodes are closed on the work and the contactor is closed. The Ignitron rectifier causes direct-current to flow in the primary of the welding transformer. When this current reaches the point where the current limiting relay is set, the relay operates and opens the contactor. The rapid decay of current in the welding transformer primary causes a high induced current through the secondary and the work, which makes the resistance weld. Welds produced in this manner will be consistent, depending on the accuracy and setting of the current limit relay.

The capacitor energy storage type is illustrated in one of the accompanying sketches. Here again, energy is taken slowly from a three-phase a-c line and rectified electronically to supply d-c to a large capacitor bank. An electronic voltage limiting device stops the charging of the rectifier when a predetermined voltage has been reached. This can be adjusted between 1,000 and 3,000 volts d-c. This potential is maintained on the capacitors by a trickle charge scheme which is tied in with the voltage adjusting circuit. When the operator closes the weld initiative switch in the thyratron circuit, the Ignitron is fired, allowing the energy stored in the capacitor bank to discharge into the weld. Welds made in this manner are consistent if the same capacitance and d-c voltage settings are maintained.

Magnetic energy storage resistance welder and control



Capacitor energy storage resistance welder and control



ELECTRICAL WEST

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Occasion for Pride

IN THE 25 years that the editors of ELECTRICAL WEST have been compiling this annual review of industry progress there has never been an occasion when the men and women of the industry could take more pride in their achievements than right now. As the pages of this issue set forth, the whole industry has literally and figuratively gone all out for war.

Here in the Far West every demand for electricity for guns, ships, planes or other armament has been met successfully. No soldier can say that a single gun, plane or shell failed to get to the front on time because of a strike of electric power. Power has never been in the category of "too little or too late." And on top of this achievement the expanding civilian demands have been met without recourse to curtailment or rationing. There have been sacrifices as the industry put all of its human and material resources into the war effort. Manpower has answered the call to arms and women do men's work; the industry's salesmen are either utilization counselors, service experts or in fields totally foreign to previous work; substitutes and alternative materials have been accepted for the duration. All of this has been done willingly with full realization that no sacrifice is too great if one human life can be saved or victory brought one day closer. Yes, the industry can be proud of its war record.

For a Change of Law

THE Hood River PUD election represents a classic example of the degree to which the original intent of legislation can be perverted. In emphatically defeating the proposal which would have placed the electric service facilities of large parts of Oregon and Washington in the hands of a small rural district embracing only 1,428 electric customers, the voters pointed to a glaring weakness in the Oregon constitutional amendment which authorizes creation of people's utility districts. The constitutional provisions granting such districts authority to acquire and hold real estate and other property "necessary or incident to the business" fail to include any limitations which would preclude such a fantastic undertaking as that proposed by the Hood River PUD. This failure to limit authority was taken by the Oregon Supreme Court as an implied grant of authority. Hence in a decision ruling on the right of the Central Lincoln County PUD to own and operate property outside its district, the court held that such a practice was legal. With this court decision as a basis for its action, the Hood River group proposed its grandiose program.

Whether the legislators and the people of Oregon will profit by the example of Hood River and plug the loophole which is so evident in the existing law is problematical. Such protection is warranted. Unless it is provided, there will certainly be other ambitious schemes of a similar character.

Not What Light, But More Light

MUCH of the loose talking and thinking regarding the postwar positions and policies respecting incandescent and hot and cold cathode fluorescent light sources falls in the "hoot-nanny" category. In the vocabulary of one of our newspaper editor friends "hoot-nanny" implies the progeny of a hoot owl and a goat. Certainly some of the proposals fall far short of any sort of rational or realistic approach to the subject.

For any organization or group in the electrical industry to say that "this" or "that is to be our postwar policy" with respect to any or all of these light sources is to fly in the face of providence. The public will very largely determine policy, for the public will get what it wants. In this case it is likely to be "the best and the most for the least expenditure of money." In terms of lighting developments based on wartime research and prog-

ress, this promises to be a lot—at least more than the public has received in the past.

The attitude of some utility people toward the situation smacks of the short-sighted viewpoint in the days when the tungsten lamp replaced the carbon globe. Then the belief was that this new light would halve load and revenues and hence should be looked at with alarm and repugnance. The facts are that the new source, being not only cheaper but better as well, doubled consumption instead of halving it. There is every reason to believe that the newer light sources will have a similar effect, particularly if they meet the requirements of quality, efficiency and cost.

As a matter of fact, it would appear foolhardy to attempt to establish postwar policies now without factual data on which to base premises. For our part, we would like to see comparative data on all aspects of the three different lighting techniques. Certainly there are sufficient installations to enable the compilation of such data. Before any policies are set now which may later be retracted with regret, it would be well for truly representative industry committees to collect and collate some factual information. After that policies based on facts and not on theory might be established.

Material Hoard

UNDER the wholly excusable policy that it is better to have too much than not enough with which to fight a war, the Army and the Navy have accumulated tremendous stocks of electrical and other equipment. Much of it will be consumed and much held against an emergency. But some of it already is being offered for sale. As one correspondent to ELECTRICAL WEST puts it,

"Now the question arises: Shall the local jobbers and utilities grab this material for their own trade or use and cancel their orders with the manufacturers, or shall they handle their business through orderly channels? Shall the region's utilities participate in the breakdown of normal buying procedure and buy right now some of the heavy-duty equipment they need from junk dealers who have bought up such surplus stocks from the government? A lot of it is new, or thoroughly reconditioned equipment and very hard to get. Or shall they struggle along with repaired and patched up stuff, eliminating the salesmen who have served them for many years, eliminating the jobbers?

"To date they have not acted, but will this sentiment prevail in other sections, or will there be a buying spree which would wipe out the manufacturers' backorders for future delivery upon which much of the postwar employment must depend?

"Incidentally," he adds, after noting an instance, "how does it happen that established and ethical firms are repulsed by the Army at a depot after being encouraged to submit bids by the Procurement Division, and then later the material shows up in second-hand establishments and junk dealers' yards? Here is a situation that calls for orderly handling."

Obviously what the author of this letter had in mind was the chaotic condition which existed after World War I. Now—26 years after that war—there are still remnants of goods and materials to be found in "second hand" establishments on back streets. Because of the greater quantities involved, this time the situation will be worse.

No one can criticize the Army or Navy for ordering above their needs so as to have plenty. But in the postwar program of the government it is highly important that someone who knows the problem and has some respect for established distribution channels and the necessity to keep them from chaos, be placed in charge of the liquidation of these surplus stocks. Employment, sound recovery, freedom from panic all depend upon it.

OPPORTUNITY of enterprise — the chance for an individual to advance as far and as fast as his ability will carry him—that's what young people want and that's what America needs. That's what our boys will be looking for when they come back to a home of peace after victory is won. They know that the America they are fighting for was built under a system of free enterprise and that, with this as a guiding principle, America has attained world leadership in almost every field of endeavor—transportation, communication, electricity, science, medicine, business, education, farming, or "what have you." It is freedom of enterprise that encourages individual men and institutions to pay so much attention to what they point to as "my record." It is the ideology behind the school kid's report card, the football team's score, the business man's balance sheet—it is the moving force that breaks records, brings home trophies and builds champions. Under America's fifth freedom the money and talents of a lot of people have been pooled for mutual benefit in the rendering of valuable public services. Right now the big job is winning the war. When peace comes, the skills and "know how" of our organization will be geared to peacetime pursuits and rebuilding for democracy with freedom. — Frank McLaughlin, president, Puget Sound Power & Light Co.

PCEA Panorama — Edited by Mary Shoop

Home Planning

Institutes Sponsored in California

A SIGNIFICANT event in the field of preparing the public for postwar homebuilding opened Jan. 18 in Pomona, Calif., in the form of a free Home Planners' Institute. It meets each Tuesday night for a two-hour session at Pomona High School and will have a duration of 17 weeks.

The institute is sponsored by a Pomona civic committee representing local banks, building and loan agencies, utilities and building material companies, and is under the auspices of the adult education department of the Pomona school system. Some of the town's most prominent citizens are active in the movement.

The electrical industry is well represented. The Pacific Coast Electrical Assn. was one of its originators and has been active in forging plans forward to completion. The Southern California Edison Co. is one of the institute's most active backers. H. L. Moore, Edison Pomona district manager, is chairman.

Purpose of the institute is to give the public a complete course of educational lectures on all phases of home building, including selection of the site, design and construction of the home and everything that goes into it, including plumbing, roofing, electric wiring, lighting, etc. Qualified speakers from each industry will present the various subjects.

A meeting on adequate wiring, with A. B. Smedley as speaker, one on general home lighting, with R. A. Buckby, and one on garden lighting, with F. B. Nightingale, will tell the electrical story in a convincing fashion.

Establishment of similar Home Planners Institutes throughout California is planned, with PCEA originating the movement that begins the institute.

Code Clearinghouse

PCEA is now functioning as a clearinghouse for electrical inspectors on interpretations of the National Electrical Code and the Uniform Electrical Code. Electrical inspectors are invited to direct inquiries of this kind to a committee appointed by the Southern California chapter of the Electrical Inspectors Assn. The committee is headed by A. C. Veit, chief electrical inspector, Los Angeles County, chairman. Arthur Kempston, field representative, PCEA, is secretary of the committee. Frank A. Short, electrical engineer, State Industrial Accident Commission, is another member.

A copy of each inquiry received by the committee and the interpretation prepared in reply will be sent to every electrical inspector in California. In this way, they will be advised fully on the manner in which other inspectors are interpreting code requirements, and complete uniformity will gradually be developed.

Electriquiz

G. R. Best, central station division, General Electric Co., Los Angeles, is the author of this interesting quiz. Answers, page 116.

1. What is a good rule for estimating full-load currents of a three-phase induction motor?
2. Is the electric motor two times, three times or six times as efficient as an automobile motor?
3. How does the steam engine compare with the electric motor in efficiency?
4. How many electric motors are in regular use in your home?
5. What electrically operated device helps you most in your daily work?
6. Does a Flying Fortress use 12, 42 or 64 electric motors to pump fuel, open and close doors, and raise and lower wheels?
7. Are there more people or more electric motors in the United States?
8. Did approximately 1, 10 or 30% of all electrical energy generated in the United States in 1943 pass through electronic devices?
9. What is recognized as the most accurate measuring device in common use?
10. It is estimated that American industry is producing at approximately 175% of its peacetime rate, practically all of its output being for the war effort. Is the electrical manufacturing industry producing war goods at the rate of approximately 150%, 300% or 400% of its peacetime production?

Inspectors Advise

The adequate wiring committee of PCEA is receiving the benefit of the experience of a postwar planning committee of the Southern California Electrical Inspectors Assn. which is acting in an advisory capacity to the PCEA committee.

At the Jan. 26 meeting of the inspectors association, Chairman I. E. Bartlett, electrical inspector, Inglewood, appointed the new planning committee to consider wiring materials which have been adopted under the wartime emergency program and determine which might be retained advantageously in the postwar wiring field.

The committee consists of William J. Tretheway, city electrician, Huntington Park, chairman; E. E. Malmgren, electrical inspector, Alhambra; H. V. Dobson, electrical inspector, Santa Barbara; A. C. Veit, chief electrical inspector, Los Angeles County; O. D. Butterfield, electrical inspector, Torrance.

H. C. Rice, manager of domestic sales, Southern California Edison Co., heads the PCEA adequate wiring committee.

Elections

Officers of the San Francisco Electrical Contractors Assn. Inc. were re-elected at the annual meeting in January. George W. Abbett will serve as president for a third term; James Gavin will continue as vice-president, Edward Scott as secretary and George Smith as treasurer. Changes in the directorate were caused by resignations of contractors who have closed their businesses for the duration.

A total of $290,700 in War Bonds was purchased by contractors and their electricians through the War Savings Bond Bureau of the association and IBEW No. 6 in its first year of operation, it was reported by Clyde L. Chamblin, bureau chairman.

A gift and testimonial of thanks were presented to G. Walter Spencer, past president, upon his retirement from business to go into farming. Spencer was president during the days of the formation of the bid depository and also served as chairman of the committee administering that independent organization.

Officers of the Washington Chapter IES are: B. A. Travis, Austin Co., chairman; P. S. Linscott, Crouse-Hinds Co., secretary-treasurer. Committee chairmen: William Creech, Graybar, program; W. K. Turner, Curtis Lighting, membership; Charles T. Bakeman, Puget Sound Power & Light, attendance and reception; Harry B. Batchelder, Puget Sound, extension; Ray U. Muffley, Puget Sound, publicity; William D. Williams, Seattle City Light, standards.

SAVE BOTH GUESS AND WORK IN INDUSTRIAL ELECTRICAL CIRCUIT PROTECTION

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- CIRCUIT BREAKERS WITHOUT ENCLOSURES
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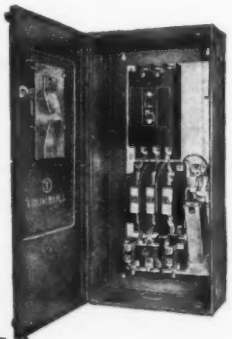
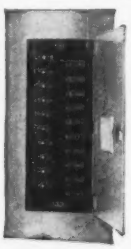
"AT" Enclosed Industrial Circuit Breaker, 15-600 amp.

M-1 and M-2 Industrial Multi-Breakers, 15-100 amp.,—230V. AC only.



"AT" Circuit Breaker Disconnect in Combination Motor Starters. Sizes, 0, 1, 2, 3; 15 to 225 amp.

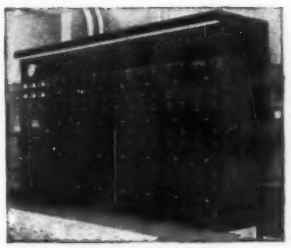


"AT" Circuit Breaker Panelboard.

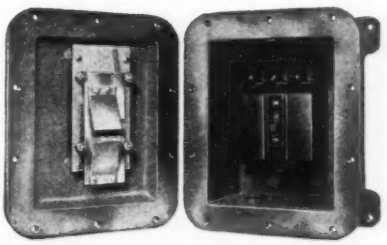
- A comprehensive line built around a single basic operating unit . . . the Trumbull "AT" Breaker unit.
- Designed to keep plant power and lighting circuits ALIVE . . . to act quickly in case of overload or short circuit . . . and to restore service just as quickly when trouble has been corrected . . . with nothing to replace or renew.
- 15 to 600 amp.;—125 to 600V. AC or 125 to 250V. DC;—2 and 3 pole, (15 to 50 amp. available in single pole). Also with solid neutral, 2 pole 3-wire, or 3 pole 4-wire.
- Quick-Make and Quick-Break.

† Available also in cast iron, water tight (NEMA Type 4) and explosion proof enclosures (NE Code Class 1 Group D).

TRUMBULL CIRCUIT BREAKERS



"AT" Circuit Breaker Switchboard.



"AT" Circuit Breaker in explosion proof enclosure.

"AT" Circuit Breaker Unit for all applications.

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Infrared Explored

Food Drying Applications Discussed at Meeting

Infrared lamps have only limited and special applications to the dehydration of fruits, vegetables and meat, was the conclusion to be drawn from the thorough analysis of the problems involved, made by W. B. Van Arsdel, chief of the engineering & development division, Western Regional Laboratory, U. S. Department of Agriculture, at Albany, Calif. to the Illuminating Engineering Society, San Francisco Bay Cities Section, Jan. 20, at Pacific Gas and Electric Co. auditorium, Oakland. Romaine Myers, consulting electrical engineer, chairman of the section, presided.

In thoroughly scientific fashion Van Arsdel explored the possible applications and also the obstacles to the use of infrared radiation for food drying, either to improve quality, increase capacity, provide economy, or decrease the first cost of equipment.

Because food in dehydration must be kept within a relatively low temperature range and because the process of dehydration consists chiefly of a transfer of moisture from the product to a drier air in almost any circumstances, the conclusions were drawn that unless the product had very high value or special conditions called for it, infrared would prove more costly than conventional air drying methods. Where heat needed to be transmitted through a vacuum, however, infrared offered possibilities. In the dehydration of meats and fish, where the product can be cooked, some field of use may be found.

Robert Dearborn, vice-president and program chairman, announced that the next meeting would be held at the University of California illumination laboratory and would be in charge of Prof. L. M. K. Boelter. The subject will be *Thermal Aspects of Lighting.*

Unions Consolidate

Consolidation of several local unions in one natural economic area is "proceeding according to plan" in the West. Latest group of locals of the International Brotherhood of Electrical Workers to be grouped are those in San Francisco, San Mateo County and Marin County, under Local No. 6, San Francisco. The linemen's local, No. 202, is included, and Charles Foehn, business manager for No. 6, is heading the group. A similar plan is contemplated for the East Bay locals, under No. 595, Oakland, according to word from J. Scott Milne, international vice-president, recently. The locals of the Los Angeles area were consolidated in this manner last year. Milne had previously brought all the locals in the state of Washington into more logical groupings.

Contractors Reorganize

At a special meeting in San Francisco recently, the Electrical Contractors Assn. of Northern California Inc. was reorganized, becoming the Northern California Chapter, National Electrical Contractors Assn., Inc.

With reorganization came a new financial policy and the establishment of a new office in the Western Merchandise Mart, 1355 Market St., San Francisco. The office also is headquarters for W. J. Varley, Western field representative, NECA.

Officers elected for the chapter: T. L. Rosenberg, Oakland, president; Ed Pierce, Vallejo, vice-president; W. A. Cyr, secretary-treasurer. Directors are: George W. Abbett, San Francisco; Wesley Evans, Salinas; Seth Cohn, San Mateo; J. D. O'Connor, Sacramento; Roy Butcher, San Jose; T. M. Robinson, Fresno; Tom Dury, Bakersfield; Grover Grider, Stockton.

More extensive field work on behalf of contractor members is promised in the reorganization of the chapter, directed toward obtaining more jobs.

Meetings

Electronics At Work was the subject and E. W. Morris, Westinghouse, the speaker at the Jan. 3 meeting of the Los Angeles Electric Club. Motion pictures, *Principles and Applications to Industry*, followed the talk. At its Jan. 17 meeting, the club heard Justus F. Craemer, California State Railroad Commission, discuss *California and the War Effort.* Mass production, natural resources and the electric and gas utilities' contribution, as well as facts pertaining to the electrical production and distribution in California as compared to other localities and to the Axis countries, were points covered by Craemer.

Electrical Maintenance Engineers' Assn. of Northern California heard a discussion of *Fiberglas—A New Basic Material*, by Don F. Courteleigh, representative of the Fiberglas Co., Jan. 27, at PG and E Building, 447 Sutter St., San Francisco. Use of glass insulation, particularly for electrical wiring, motors and for heat insulation of buildings, was covered.

O. K. Jones and Art Veit discussed emergency materials and wiring devices at the Jan. 20 meeting of the Los Angeles Electrical Estimators.

Puget Sound IAEI has scheduled its regular quarterly meeting for Mar. 3 at the 40 & 8 Club in Seattle. Code discussion is on the agenda.

Postwar Lighting

Industry's Future Bright, Los Angeles IES Told

A promising postwar picture for the lighting industry was painted by Leonard Hobbs, Smoot-Holman Co., in a talk at Los Angeles before the IES, Southern California Section, following his recent trip east. Companion feature on the "double bill" was the showing of color movies of Alaska by John Q. Adams, Alaskan guide.

Hobbs attended the RLM meeting in Cleveland and the WPB Incandescent Lighting Fixture Advisory Committee meeting in Washington, and visited the lamp factories. He told of the circular type F lamps to be available after the war and of other experiments being made on different sizes and wattages of fluorescent tubes, in both high and low voltage, and on high-intensity mercury lamps of sizes between the 400-watt and 3-kw. lamps.

Endeavor of the RLM Standards Institute to improve the quality and broaden the line of reflectors bearing its label was told by Hobbs. These reflectors include incandescent and fluorescent types for industrial purposes only.

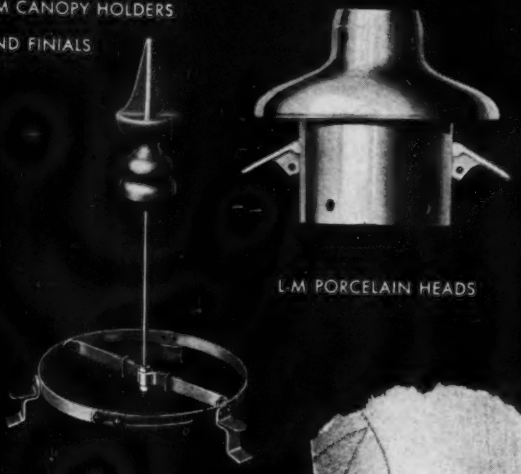
Stating that the WPB in Washington is trying to relax restrictions on limitation orders as rapidly as the material shortage is eased, Hobbs asked the Industry's cooperation in complying with these orders. There has been some easing in the copper and the aluminum situation, he pointed out, and most critical items at present are steel, fiber cartons and manpower. A reason for the strict control of fluorescent lighting equipment is the shortage of beryllium used in the powders, he stated.

In conclusion, he suggested that the greater possibilities for industrial lighting seemed to be in the East, while Western markets would be largely commercial and domestic. He said that the WPB expected to carry on its work beyond the duration to cushion the effect of the war's end and, so far as possible, to see that no commercial advantage was given one firm over another. Thus the Industry should be able gradually to absorb employees released from war work, he said.

● F. E. Bodine, Salt Lake branch manager of Westinghouse Electric & Mfg. Co. was elected president of the Electrical League of Utah at its annual meeting in January. Other officers for 1944 are: Kimball Vance, first vice-president; George L. Ellerbeck, Ogden, second vice-president; and J. F. McAllister, secretary-treasurer. George L. Nelson was re-appointed manager.

L-M DIAMOND MESH ORNAMENTAL GLOBES AND CANOPIES

L-M CANOPY HOLDERS AND FINIALS



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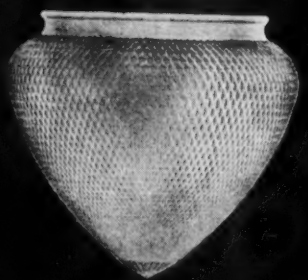
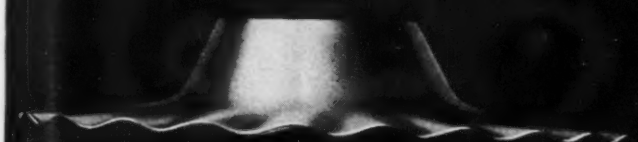


L-M REFRACTORS



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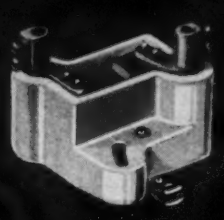

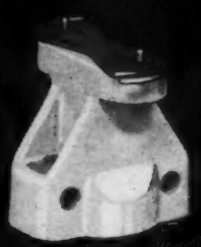

L-M SOCKETS AND RECEPTACLES

NEWS of the industry

WESTERN PROJECTS IN HOUSE RESOLUTION

Approximately $85,000,000 in projects affecting the Pacific Northwest are included in House Resolution 3961, recommended for early passage by the House rivers and harbors committee. The bill authorizes the projects but provides no funds for them and stipulates that none shall be appropriated for or constructed until six months after the end of the war unless approved by a war agency and by the president.

The legislation would provide five more dams on the Columbia River, including the $50,000,000 Umatilla project between Bonneville and Grand Coulee on which core drilling has been started. The other four dams, to cost $30,000,000, would be located on the Snake River between Pasco, Wash. and Lewiston, Idaho. Ultimately another nine dams are contemplated in the region but these are not figured in this resolution.

The bill also provides that about $3,600,000 would be spent for Willamette River improvements in Oregon, including a single-lift lock at Oregon City for $2,500,000, replacing four small locks. Channel improvements in the Willamette and Yamhill rivers call for $1,100,000. Other minor projects call for expenditures on river and bay projects of: $190,000, Chetco River; $89,000, Umpqua River; $162,000, Yaquina Bay; $214,000, Depoe Bay; $120,000, at Bayocean.

Of the five Columbia River basin dams mentioned, Umatilla site has been chosen. The other four sites are still tentative. Award of a contract for core drilling on the Umatilla site is a link in a rather checkered history of that project thus far. In 1940, the United States Senate struck out an item of $23,700,000 in the rivers and harbors bill of that year for construction of the Umatilla Dam. Now the committee has approved an expenditure of $49,470,000 for the same purpose.

When the U. S. Army Engineers first submitted the project to Congress, June 7, 1938, it was as a part of a proposed system of dams in the Columbia and Snake designed primarily to improve navigation. It was not approved and Northwest congressmen then filed a separate bill for Umatilla Dam, which also failed of passage.

After that, proponents of the project soft pedaled the importance from a navigation standpoint and switched over to its importance as a hydroelectric unit which would add some 600,000 kw. As such, it is now urged by the Bonneville Power Administration which wishes to see it providing additional power by 1946. The Administration predicts that Bonneville and Grand Coulee plants will be producing 1,316,400 kw. this spring, but is willing to gamble public money to the extent of $50,000,000 that the first postwar decade will bring a demand for an additional 1,700,000 kw.

Enthusiasts at the same time are pointing out that it would only cost $30,000,000 more to extend a nine-foot channel for navigation from Bonneville to Umatilla, and a six-foot channel on the Snake beyond Lewiston, opening a "vast new era of water-born commerce" between the Pacific and the Inland Empire. Since Bonneville Dam was completed some years ago, the bottom step in navigation up the Columbia, exactly one ship of size has been passed through the locks, as an experiment.

Snohomish PUD Makes New Bid For Utility Properties

A new offer of $5,200,000 for properties of the Puget Sound Power & Light Co. within the Snohomish County (Wash.) PUD has been made by the allied negotiating committee. With the offer, the district served formal notice that it would construct its own electric distribution system, if the company refused to sell.

In recent condemnation proceedings, the company asked $13,500,000 for the properties as against the PUD offer of $3,710,000. The jury award was $9,500,000.

According to Bernard L. Pearce, executive secretary of the PUD committee, the new offer does not constitute a price increase, since additional lines and properties are included.

Meanwhile, a plan being formulated by the PUD negotiating committee, representing all districts in the area, would unit 18 PUDs, Seattle City Light and Bonneville in simultaneous offers for the company's properties. Seven districts are reported ready to buy.

● AUTHORIZATION of an offer of $3,194,000 for Puget Sound Power & Light properties in Kitsap County and "some tag end of lines" running outside, has been made by Kitsap County Public Utility District commissioners in Bremerton, Wash.

UTILITY PLANT ACCOUNTS UP FOR SEC HEARING

Under an order issued by SEC, Montana Power Co. must show why it should not eliminate more than $53,000,000 from its plant account and prepare further studies regarding disposition of an additional $4,000,000. Hearing, originally set for Jan. 31 at Washington, has been postponed until March 13 and will be held in Montana.

The amounts involved represent approximately 46% of the company's book cost of electric plant, according to the SEC, which reports it found $54,660,127.94 to be the original cost of the company's electric plant as of Jan. 1, 1937, effective date of the uniform system of accounts.

Announced Jan. 6, the commission order directed the company to show why it should not (1) dispose of $2,707,690.26 now classified in the account designated as "common utility plant acquisition adjustments," in accordance with an appropriate method developed from evidence at the hearing, (2) dispose of $50,632,841.26 representing "write-ups" and other inflationary items in its electric plant accounts, in accordance with such plan as the commission shall approve or prescribe and (3) prepare additional studies with respect to $4,031,252.69 in its electric plant account for the purpose of determining the appropriate classification and disposition of this amount in accordance with the requirements of the commission's uniform system of accounts.

Hood River Voters Reject $175,000,000 Proposal

Voters within the Hood River PUD on Jan. 7 turned down the $175,000,000 bond issue, with which the district sought to buy out electric properties in northern Oregon and parts of Washington. More than 1,400 of the 2,000 registered voters in the rural area comprising the district cast their ballots, with final count, 865 against, 552 for.

Sponsored by Guy C. Myers, New York broker, the plan envisaged purchase of Pacific Power & Light Co., valued in its entirety at approximately $43,000,000, and possibly Northwestern Electric and Portland General Electric companies.

Oregon law would have allowed the PUD to operate outside its boundaries.

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with the only grating that has the unique twisted bar!
No time for "absenteeism" caused by injury these days. Install non-slip Blaw-Knox steel grating. BETTER FIVE WAYS.
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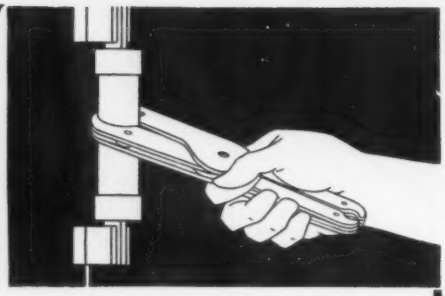

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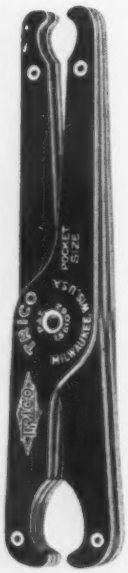

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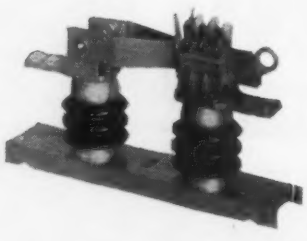

Southern California and Arizona Representatives

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SEC STARTS HEARINGS ON FEDERAL CONSOLIDATION

SEC hearings on petition of Federal Light & Traction Co., subsidiary of Cities Service Co., to consolidate its holdings in New Mexico, Arizona and Colorado were to begin on Jan. 27 at Philadelphia.

The proposed reorganization plan would merge with Tucson (Ariz.) Gas, Electric Light & Power Co., six Federal subsidiaries: Albuquerque (N. M.) Gas & Electric; Las Vegas (N.M.) Light & Power; New Mexico Power, Trinidad (Colo.) Electric Transmission; Deming (N. M.) Ice & Electric; Stonewall Electric.

At issue is Federal's right to retain interest in the Tucson, Deming and Stonewall properties. SEC previously has declared the other four companies to constitute an integrated system.

The City of Tucson has petitioned the SEC to order divestment of the Tucson system, in order to permit purchase by the city.

Meanwhile authorization for issuance of $9,500,000 in revenue bonds for purchase of the Tucson company has been voted by qualified taxpayers of South Tucson, a suburb of about 2,500 population. Purchase of the properties must be negotiated at a price as yet undetermined.

Voters of Tucson rejected a similar plan last October. To prevent acquisition by South Tucson, condemnation proceedings have been filed against the company by the Tucson city attorney.

City May Distribute Shasta Dam Power

Shasta Dam power may be distributed at cost by the City of Redding, Calif., if a proposal by Charles E. Carey, USBR regional director, is adopted. The city now buys power for distribution from Pacific Gas and Electric Co.

According to Elbert Dick, city electrical department supervisor, the city could reduce power bills 37% under the present program. He stated that during the past five years the city's receipts from electric sales have been $1,469,283; its payments to PG and E for the power have totaled $619,000 during the same period.

Proponents of the plan state that industry will be attracted by the cheap power. It has been pointed out that increased property taxes will be borne largely by absent property owners.

● SEC APPROVAL has been secured for sale by Federal Light & Traction Co. of the Rawlins (Wyo.) Electric Co. Buyer is Edmund Steinauer of Lincoln, Neb.; price is $350,000.

Free Enterprise

. . . INCENTIVES AND TAXATION

There are three principal ways of making a living:

1. Getting on someone's payroll
2. Lending one's savings to business enterprises
3. Starting, or helping to start, a business enterprise

About three out of four of us fall in the first group—we are *job-holders.* Millions of us get some income, large or small, by lending our savings—directly or through such channels as insurance companies. We are suppliers of *loan-capital.* About one out of four of us has his own business enterprise, and several millions of us are part owners of business enterprises. Those of us who go into business for ourselves and those of us who are part owners of enterprises are *job-givers.*

The amount of employment in a community depends, in the main, on the number of persons who attempt to make their living, or part of their living, by giving jobs to others, rather than by getting on someone's payroll. A community seriously desiring a high level of employment and a high standard of living will strive to make job-giving attractive and to encourage a large part of its population to be job-givers rather than merely job-holders.

The number of men who attempt to make their living in whole or in part by starting new businesses or by expanding old ones depends upon the outlook for profits. When the outlook for profits improves, thousands of new jobs open up and thousands of men go to work; and, as men go to work, the farmer and everybody else benefits. When the prospect for profits becomes darker, the demand for labor, capital, and raw materials drops. It may be roughly estimated that an improvement in the prospect for profits of one billion dollars raises the demand for labor by anywhere from two billion dollars to five billion dollars.

One of the principal determinants of the outlook for profits is the amount and the nature of taxes. After the war, the Federal government will need to raise each year about twenty billion dollars in taxes—three times the amount required before the war, and six times the amount re-

quired in the Twenties. In the Twenties, the tax needs of the Federal government were roughly twice as large as corporate profits in a good year. After the war, Federal revenue needs will be roughly three times corporate profits in a good year. Obviously, it will be much more difficult, after the war, for the government to meet its needs *without discouraging enterprise,* and therefore without diminishing the number of jobs, than it was before the war. Far more than ever before, it will be necessary for the government in developing a tax program to take account of the effect of taxes upon employment and the standard of living. This means that it will be important for each and every citizen to give attention to these matters—because the policies of the government reflect, in the main, the thinking of the citizens.

Some taxes seriously discourage individuals and business firms from undertaking new and enlarged operations. Other taxes have little or no adverse effect on investments. Some taxes are a burden on consumption, affecting the sales of specific commodities, depending on the nature of the taxes. It is obvious that different kinds of taxes have different economic influences. *We must understand the forces that determine the level of employment and consider the tax program in relation to other measures designed to create more jobs.*

What are the tests of a good tax system?

1. Taxes should be designed to encourage production and enterprise and to make it attractive for a large number of people to earn all or part of their living by giving jobs to others.

2. Taxation must be fair in principle and administration, with no discrimination between persons in similar circumstances.

3. Taxes should be apparent and not concealed, and should be levied, in the main, directly upon individuals so that each of us will know how much our government is costing him. A moderate income tax at the lower income levels will bring a greater awareness of responsibility than will heavy taxes on consumption which the taxpayer does not see because they are hidden in the prices he pays.

4. In the aggregate, taxes should be somewhat progressive.

5. The tax system should be coordinated with the broader objectives of monetary and fiscal policy.

6. **Federal, state, and local tax policies should be integrated as to principles and objectives.**

Judged by these standards, our present tax stem is extremely unsatisfactory; in fact, it is tually damaging. It is a conglomeration of dden and direct taxes and of conflicting taxing risdictions and policies, with no comprehen- e economic motive. It is distorted to appease ssure groups and includes uneconomic puni- e measures. It is full of needless complexities. is a paradise for tax lawyers and a source of nfusion and despair for the honest, enterpris- g business man. In fact, it would seem almost if our tax laws had been written by some fifth lumnist for the purpose of making private terprise unworkable. We in America pretend believe in the pioneer spirit, but no one would er suspect it by looking at our tax system. When the war is over, there must be a thorough form of our entire tax system. Federal taxes can d should be reduced substantially; and, in the ocess of reduction, changes can more readily introduced. At that time, steps can be taken achieve some degree of coordination and unity purpose among federal, state, and local taxing encies. Taxes play too important a role in our tal economic life to ignore the adverse conse- ences of unrelated and inconsistent policies of different taxing jurisdictions.

The following reform measures are needed in federal taxation:

1. Repeal of the excess profits tax at the earliest possible date after inflationary dangers subside. In the case of most enterprises, the excess profits tax destroys all incentive to do a larger volume of business than in 1939; it appropriates virtually all increase in profits above the level of 1939.

2. Coordinate corporation and individual income taxes so as to avoid double taxation and impediments to risk-taking. Preferably, corporation income taxes should be wholly eliminated. Otherwise, the corporation tax rates should be reduced to the lowest effective rate on personal incomes. Full credit should be given to stockholders for all corporate income taxes paid.

3. Encourage competition and particularly the formation of new enterprises by allowing new corporations generous tax exemptions for a period of five years. Extend the same principle to unincorporated concerns.

4. Encourage risk-taking (and hence job-

giving) through extending the loss carry-over to six years or more.

5. Provide for averaging incomes over a period of years in order to remove discrimination against those with irregular incomes and those who take risks of loss in business ventures.

6. Rely upon the personal income tax as the main source of revenue, with broad coverage. The reduction in total taxes after the war should favor the elimination of excise taxes before reducing income taxes.

7. Reduce the upper range of personal income tax rates to a maximum of perhaps fifty to sixty per cent so that risk-taking investments will be really attractive. Higher rates are punitive in character, yield small receipts, and throttle risk-taking.

8. Encourage risk-taking by individuals in the higher brackets by making the surtax on incomes of $20,000 a year or more half as much on income in the form of dividends as on income in the form of salaries or interest.

9. Encourage risk-taking by individuals by permitting capital losses to be charged against general income provided the reduction of tax liability in any one year is not more than fifty per cent.

10. Repeal the tax-exempt privilege for all *new* securities issued by all governmental jurisdictions.

11. Eliminate excise taxes which place a disproportionate burden on persons with lower incomes so as to encourage greater consumption and provide an expanded market for our vast industrial capacity.

12. Reform tax administration to simplify forms and procedures, to broaden the scope of enforcement, and to encourage the spirit of fairness.

With such reforms and continuing reappraisal of the tax program as it affects the economic situation, we can look toward taxation as an instrument of constructive influence in giving the fullest encouragement to free enterprise and in attaining continued prosperity.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

Here's what your Industrial Customers should know about LIGHTING MAINTENANCE!

SEVEN STEPS to Proper LIGHTING MAINTENANCE
G-E MAZDA LAMPS
GENERAL ELECTRIC
TABLE OF CONTENTS
The Seven Steps to Proper Maintenance 3-5
Recommendations for Stocks of Lighting Parts 6-7
Labor-Saving Maintenance Devices 8-11
A Check List for Fluorescent Equipment 12-13
Some Facts About Lamps 14-15

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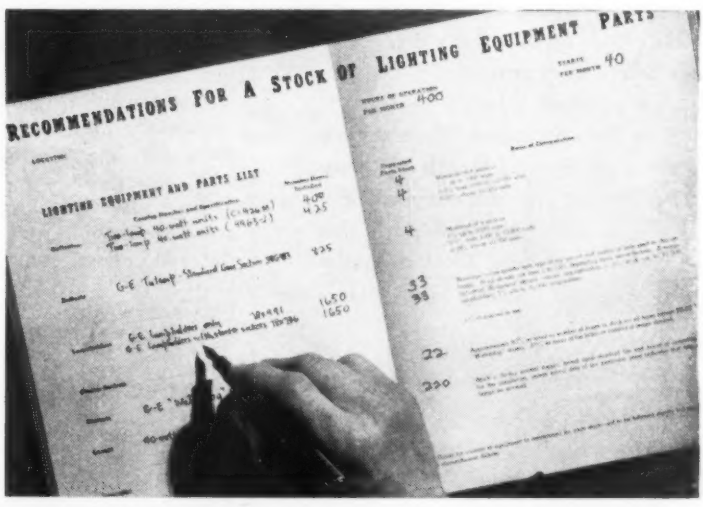

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SEATTLE AUTHORIZES ROSS DAM ADDITIONS

Expenditure of $3,189,660 for construction of two penstock tunnels around the base of Seattle City Light's Ross Dam has been voted by the city council's utilities committee.

The tunnels, 25 ft. in diameter, will carry water around the dam from the storage lake to the power generators. Construction of the tunnels will delay projected raising of the dam to its ultimate height of 650 ft., it is reported.

It is proposed that the Federal Works Agency advance $1,000,000 of the funds needed for construction.

Proposed for the postwar period is an expenditure of $5,000,000 to clear the reservoir back of the dam. Superintendent E. R. Hoffman has stated that the cost would be higher, if the area were flooded.

Bonneville Extensions Outlined By President

Plans to extend Bonneville's transmission lines to 2,321 circuit miles and to increase the number of substations to 50 before the close of the fiscal year on June 30, were outlined by President Roosevelt in his annual budget message to Congress.

For the next fiscal year, ending June 20, 1945, construction of an additional 183 miles of line and three substations is scheduled, the message said. Construction expenditures for the year are estimated at $7,135,000.

Authorization to use $3,734,000, previously appropriated for construction, for operation and maintenance was requested.

Revenues from sale of electricity from Bonneville and Grand Coulee in the 1943 fiscal year were reported to total $11,899,198. An estimate of $18,000,000 was set for the fiscal year 1944 and $21,800,000 for 1945.

Construction to Start on Coulee-Covington Line

With a bid of $198,401, Enterprise Electric Co., Baltimore, Md., was awarded the contract for construction of the 73-mile eastern section of the Coulee-Covington line. The 230-kv. line will parallel the present line from Grand Coulee to Covington, 11 miles east of Seattle.

Construction will consist of 11 sections of alternate single-circuit steel tower and H-frame wood poles, the building of tower foundations, 53.9 miles of wood pole construction and stringing of conductors.

Work will start March 1, and probably will be completed by August.

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How Many EYES on Your Payroll?

The eyes on your payroll are almost as important to your postwar costs, and jobs, and profits, as the men and women who own those eyes. Let's say your postwar payroll numbers a thousand. You will be paying two thousand eyes to work for you each day. But you may get the total work of only three-fourths of your "eye payroll"—fifteen hundred eyes, even though all two thousand are present on the job.

THERE'S A MAN in your town who will be glad to help you plan, now, to get a full eye's work out of every eye you hire. Let him start soon. You'll be glad you did—later.

How Your Local Utility's Engineer Can Help You Cut Postwar Costs

YOUR ELECTRIC COMPANY'S lighting engineer can prove to you that better lighting can cut your costs by getting a day's work out of every eye you hire. He's near you—he's a practical man who knows plants—and can give you practical help.

Of course his company's got "something to sell." But give them credit for selling it intelligently. For knowing how to advise you, and being well able to tell you what better lighting can do.

Roebling has something to sell, too. When Victory comes, we hope you will remember Roebling as wire specialists who are a logical source of supply for the wires and cables you'll need to modernize... with better lighting... air conditioning ... better power distribution to your plant's work... full utilization of all the electrical and electronic cost-cutters the war has evolved.

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THIS ADVERTISEMENT is appearing in current issues of *Mill & Factory* and *Purchasing*, carrying the Better Lighting message to 39,569 industrial executives. When industrial load building becomes a problem again, we hope these 1944 Roebling messages will have helped to pave the way for your efforts.

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COLORADO PUC RULES IN REA PURCHASE CASE

The Empire Electric Assn., Rural Electrification Administration-financed cooperative in Montezuma County, Colo., must amend its by-laws so that it can render service to non-members, as well as members, before it may acquire the properties and franchises of Highland Utilities Co., according to a decision rendered last month by the Colorado Public Utilities Commission.

Further provisos by the Colorado PUC are that the Highland Utilities shall apply to the PUC for authority to exercise its franchise rights in the towns of Cortez and Mancos, Montezuma County communities, whose sole source of light and power is derived from Highland Utilities' system; that Empire Electric Assn. shall assume all franchise rights and obligations now existing between Highland Utilities and the towns of Cortez and Mancos; that PUC retain jurisdiction over the matter for the purpose of entering any further orders deemed essential to the best interests of the citizens and communities affected by the Empire Electric-Highland Utilities transaction.

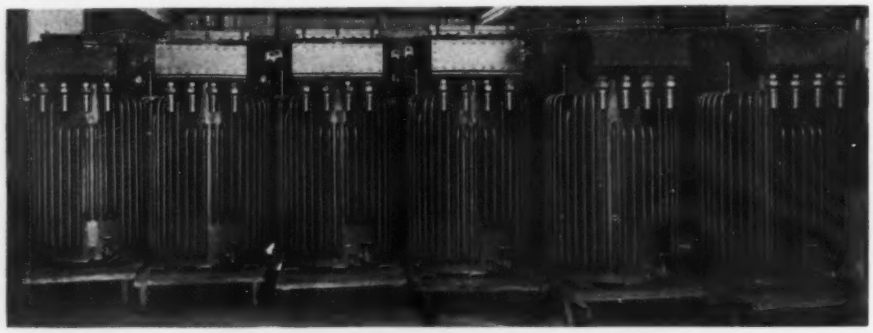
In essence the Colorado commissioners dictated the procedure of a federally sponsored institution. This was the moot point at a hearing in September 1943, when Empire Electric first sought transfer of Highland Utilities' possessions under a contract to purchase. Such acquisition is necessary to complete Empire Electric's agreement with REA, involving a $158,000 mortgage, $150,000 of which would cover purchase of Highland Utilities, and $8,000 improvements to the system. Objection to the transaction was raised by the town of Cortez which insisted that the Colorado PUC guarantee Empire Electric Assn's performance of contracts undertaken by Highland Utilities (namely, supplying light and power to Cortez). When counsel for Empire Electric asserted his clients were subject solely to jurisdiction of the federal government, the hearing was adjourned.

PUC's order stipulates the cooperative "shall furnish service within the corporate limits of said towns (Cortez and Mancos) without discrimination between members and non-members."

PUC Chairman Henry S. Sherman emphasized that the commission does not classify REA companies as public utilities, but does require them to operate under the same conditions. While the order applies only to the Empire Electric, it was clear that further orders involving REA units will include the same clauses.

The commission's records show nineteen rural electric associations in Colorado serving approximately 20,000 customers. In the past, some have announced intention of serving non-members, but Sherman pointed out that, to do so legally, they would have to change their by-laws. Members pay a five-dollar fee before getting service. Under the PUC order, the cooperative may not charge higher rates to non-members; hence the effect would be that members will pay $5 more while non-members could be obliged to pay an installation charge or other fee, to equalize the cost.

Empire Electric owns 90 miles of lines, serves 282 members.



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Expanded plant facilities, skilled engineers and manufacturing personnel required to meet the wartime demands of Pacific Coast utilities and industrials, place Gardner in a preferred position to meet your transformer needs.

For special or standard transformers, Gardner can assure you sound engineering, sturdy construction, delivery on schedule. Scores of installations prove Gardner transformers meet exacting specifications and provide trouble-free, dependable operation.

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UTILITY PROTESTS TAX ON TRANSFERRED FUNDS

Levy of additional income taxes for 1940 and 1941 on a portion of $1,524,000 which Tucson Gas, Electric Light & Power Co. transferred from its depreciation reserve to surplus was protested by the company last month before the Arizona State Tax Commission. No decision was announced.

The utility contended that the amount was not transferred to surplus but to a special capital account in the surplus to increase the book value of the company and facilitate refinancing through a $3,500,000 bond issue. By sale of the 3½% bonds, $2,650,000 of 8% and $297,000 of 6% bonds were refunded. C. L. Clawson, secretary-treasurer of the Tucson company, testified.

Kent Lockwood, commission official, stated that the funds would not have been taxable if transferred to a capital account. He questioned the effect of a SEC order approving the transfer and, in effect, earmarking the amount as a capital asset that could not be distributed in dividends until the bonds are paid in 1966.

Court Approves Utility Recapitalization Plan

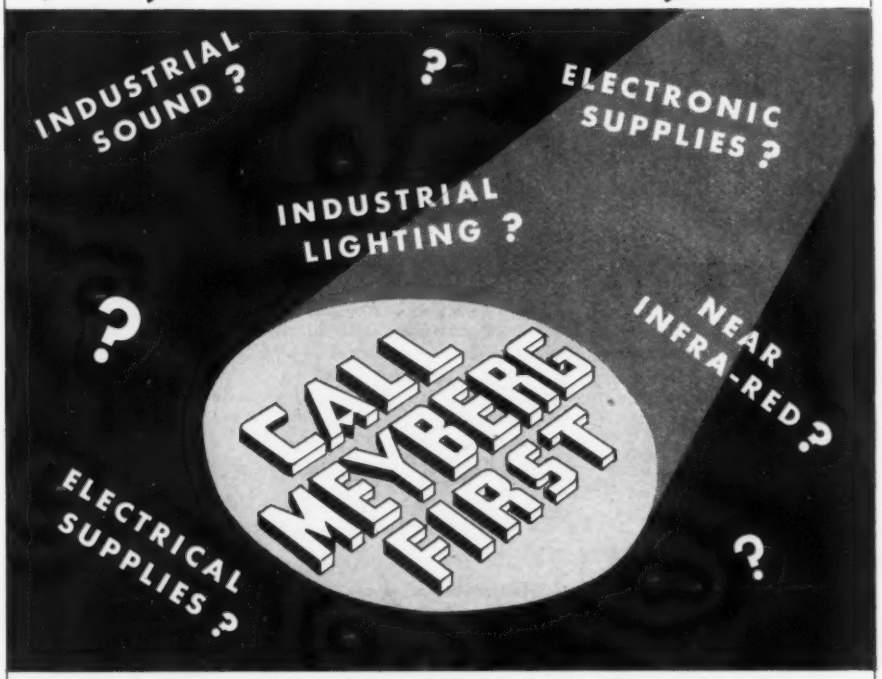
U. S. District Judge J. Foster Symes has approved recapitalization plans of the Southern Colorado Power Co., authorizing sale of $6,700,000 in new securities.

Attorneys Henry A. Steinberg, for Standard Gas & Electric Co., Chicago, parent company, and Ralph L. Carr, representing Butler Disman, opposed the program, asserting that reclassification of stock and elimination of Class B stock in the reorganization plans was made without considering prospective increased earnings.

● PLANS for enlarging the Provo, Utah municipal power plant were announced last month by Mayor Maurice Harding. The firm of Burns & McDonald of Kansas City has been employed to make a survey of future electric needs of the city and to make recommendations. Anticipated growth in population, probability that the Geneva steel plant will operate after the war to some extent and that other new industries will move into the area were given as reasons for the study.

● REMOVAL OF DIMOUT shields from Seattle's ornamental street lights has been approved by the city council and $8,300 has been appropriated for the work. Removal of the shields in the residential districts had been ordered previously.

Spotlight the **ANSWER** *to these questions*



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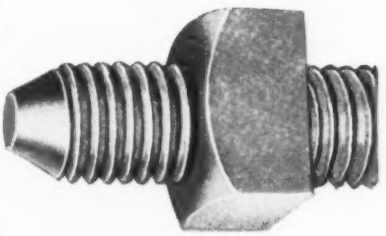
KORTICK IMPROVED POLE STEPS — ½" drive head, strong cross section, driving surface centered—blow force reacts directly to point, reinforced bottom, no bending or distortion while driving, Fetter drive threads.



KORTICK "HANDIPOINT" BOLTS save time, have greater salvage value, can be installed quickly, removed without damaging threads. Supplied on ALL Kortick Crossarm Bolts, Carriage Bolts, Eye Bolts, Guy Rods.

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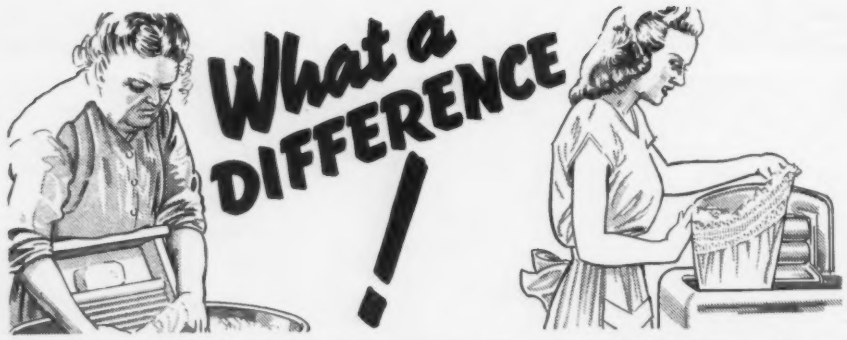

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You conserve critical steel—Briegel fittings are made with 25% less steel than any other fittings on the market.

You save time—just two squeezes with the patented B-M "indenter" (illustrated at left) and a smooth, clean connection is made. No extra turns or twists—no nuts to tighten. Up to 50% saving on precious time!

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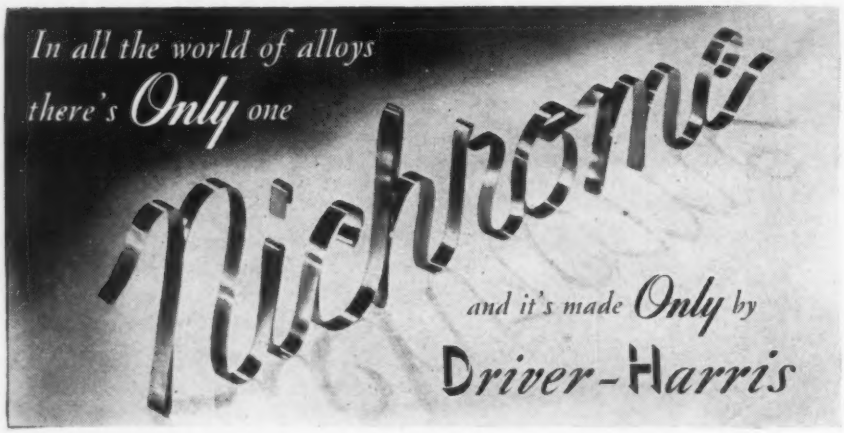
BRIEGEL METHOD TOOL CO., Galva, Ill.



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TRUSTEES RULED OUT IN PORTLAND RATE CASE

In an opinion handed down last month in the Portland General Electric rate case, Circuit Judge George Duncan eliminated the Pepco Independent Trustees as parties to the suit. The $800,000 rate cut ordered by Public Utilities Commissioner George H. Flagg is being held up temporarily by a circuit court restraining order issued on petition of the company and the trustees. [E. West, Jan. p. 96 and E. West, Dec. p. 78.]

The court order was the result of a move by Commissioner Flagg to eliminate the trustees from the proceedings on the grounds that they hold the status of stockholders in the corporation and stockholders are without authority to bring suit in behalf of a corporation unless the latter refuses to act.

Additional Details on Alumina Pilot Plant

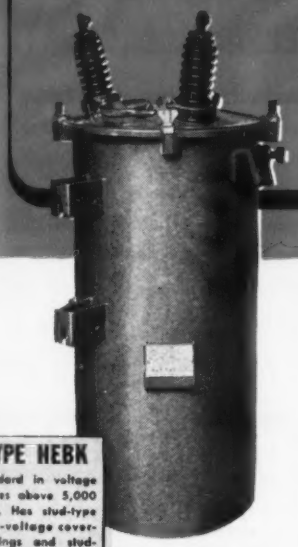
Further details concerning the alumina pilot plant to be constructed at Salem, Ore., have been revealed by James Gallagher, president of the Columbia Metals Corp. of Seattle, which is building the plant.

The ammonium bisulphate process will be used for extracting alumina from clay. This process has already been tested, as far as the second stage goes, at a pilot plant at Stamford, Conn. The third stage, which is the first commercial stage, is what will be tested at the Salem commercial demonstration plant.

A capacity of approximately 50 tons of alumina per day has been set for the first unit of the Salem plant. The alumina will be produced from the gray and blue clay deposits of the Northwest. The clay will be treated with sulphuric acid and limestone, and subjected to fusing temperatures. A 50-ton batch of alumina can then be processed into approximately 25 tons of aluminum at any of the five aluminum plants in the Northwest, which have a combined capacity of about 1,500 tons daily.

Bonneville power is to be used for the motive power requirements and for heat in the first step of the process, and it is indicated that the power requirements will be approximately 10,000 kw. For the final calcining stages, coal, oil or hog fuel will be used. Of the total power requirements, electricity will come in for 25% to 30%. The electrical power will be divided about one-third for motive power and two-thirds for heat purposes.

Wagner
DISTRIBUTION TRANSFORMERS
are standardized in accordance with E. E. I. - NEMA Specifications



TYPE HEBK
Standard in voltage classes above 5,000 volts. Has stud-type high-voltage cover-bushings and stud-type low-voltage tank-wall bushings.

WAGNER'S complete line of single-phase, 60-cycle, pole-type distribution transformers (rated 100-kva and below, high-voltage 15,000 volts and below, low-voltage 600 volts and below) are now built in accordance with E.E.I.-NEMA standards.

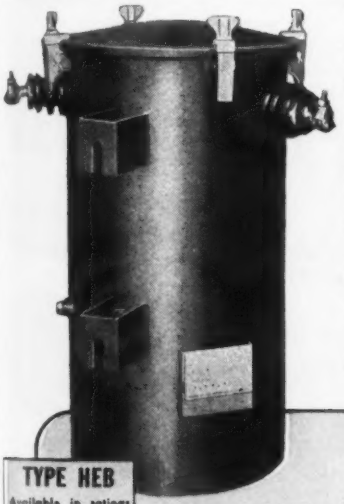
Standardized mechanical features include interchangeable mountings, bushing location, number of bushings, terminal connectors, internal connections, nameplate and pad for users' data, external grounding provisions, drain plugs, oil-level marking, and terminal insulating caps when required.

Ratings of 1½ to 50-kva are designed for direct-pole mounting through the use of two support lugs with standardized spacing. These support lugs are also used for attachment of "T"-crossarm hangers. Ratings of 75 and 100-kva have four support lugs for crossarm hangers, or accessory brackets for direct-pole mounting.

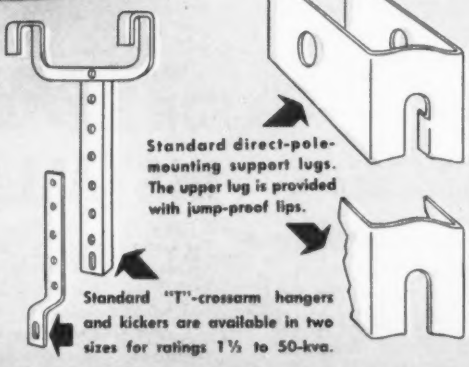
Stipulated electrical features include standardized high- and low-voltage ratings, kva ratings, polarity, low-voltage connections and taps.

Illustrated are available types of Wagner distribution transformers.

TYPE HEX
Available in ratings 1½ to 100-kva. Has high-voltage pocket-stud-bushings and low-voltage tank-wall stud-bushings.



TYPE HEB
Available in ratings 1½ to 100-kva. Has sidewall-stud-type high- and low-voltage bushings.



Standard direct-pole-mounting support lugs. The upper lug is provided with jump-proof lips.

Standard "T"-crossarm hangers and kickers are available in two sizes for ratings 1½ to 50-kva.

COMPLETE INFORMATION WILL BE MAILED ON REQUEST

TYPE HEX
Showing four support lugs for 75 and 100-kva ratings.

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ELECTRICAL AND AUTOMOTIVE PRODUCTS

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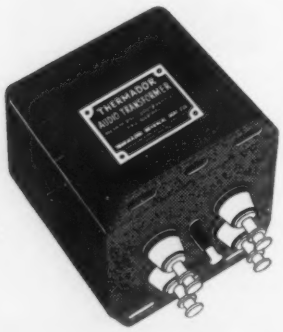

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THERMADOR TRANSFORMERS

Thermador Transformers are Thermatite treated to withstand extreme temperatures and humidity—arid or moist heat—dry or damp cold do not hamper their efficiency. Thermatite is the name of a process of accurate heat controlled vacuum impregnation developed and improved over a period of ten years.

Thermador also manufactures built-in Electric Heaters, Electric Ranges, Electric Water Heaters.

THERMADOR
Electrical Manufacturing Co.
5119 S. Riverside, Los Angeles
"Seven Leagues Ahead"

Electriquiz Answers

(See Page 98)

1. One ampere per horsepower at 550 volts. Use inverse ratio for other voltages (5/4 ampere per horsepower at 440 volts.)
2. Three times.
3. Five to one in favor of the electric motor.
4. What's your score? Did you remember your electric shaver, food mixer, sewing machine, clocks, phonograph and fan, or did you think only of your refrigerator, washing machine, ironer and dishwasher?
5. You'll have to choose your own. It could be an adding machine, electric furnace, lathe, crane, battery truck, telephone, elevator, modern high intensity lighting installation, irrigation pump or milking machine.
6. 42. (*Life* magazine, p. 89, Dec. 27, 1943.)
7. More motors. Approximately 200,000,000.
8. About 10%. More than 25 billion kilowatt-hours, primarily through rectifiers in the electrochemical and light metal industries.
9. The modern watt-hour meter.
10. Approximately 400%.

● IN A TWO-TO-ONE decision, the California district court of appeal upheld expenditures from San Francisco's Hetch Hetchy funds to finance a trip by city officials to Washington in 1941. Officials made the trip to advocate amendment of the Raker Act, following the supreme court ruling declaring illegal the city's contract with Pacific Gas and Electric Co. for distributing the power.

In its decision, the court stated that the supervisors could decide without court interference whether or not the expenditure was necessary and in good faith. In his dissenting opinion, Judge Raymond E. Peters said the money could have been taken legally from the general funds but not from the Hetch Hetchy fund.

● AN ORDER was filed Jan. 11 in the federal court in Portland, continuing a preliminary injunction in the bankruptcy petition of the Portland Electric Power Co. The restrainer will serve to keep the Chase National Bank of New York and the Harris Trust & Savings Bank from selling any collateral now held by them to secure payment of Portland General Electric Co. indebtedness.

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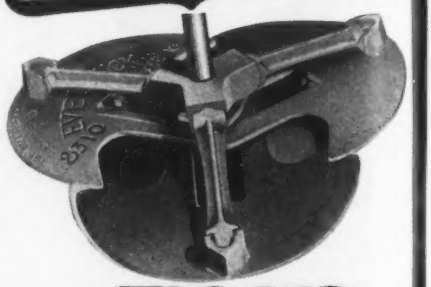

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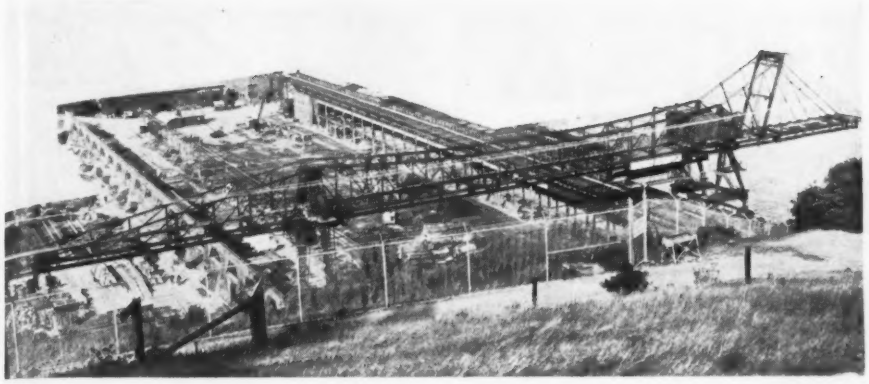

The West's largest gantry crane will be sold following 30 years of service

Huge Gantry Crane To Go To Highest Bidder

It carries no hash marks to indicate its 30-year service with the United States Navy, but having served its day of maximum usefulness to Uncle Sam, the West's largest gantry crane is to be "mustered out" in the sense that it soon will be sold to the highest bidder.

The huge crane, built in 1913 when the United States fleet still burned coal, is at Tiburon on San Francisco Bay and, in its early days, served fuel to Naval vessels operating in the Pacific. Although the Navy gave up coal years ago, the crane has continued in almost constant operation, serving a supply depot. Recently, the Navy ordered that it be sold lock, stock and barrel to make room for up-to-date equipment.

In addition to the crane, with its 447-ft. sweep and 32-ft. clearance above its tracks, 640 ft. of steel bunkers and four motors (one 150 hp. and three 65 hp. 220 volts d-c), together with a motor generator set, will be included in the sale.

Lt. Com. E. W. Fenton, sales director, Supply Dept., Mare Island Navy Yard, Calif., who is in charge of disposal, said that bids will be taken late in February.

● Coos Electric Cooperative, Coquille, Ore. last month received REA appropriations totaling $519,500. The grants included $405,000 for 182 miles of line to serve 1,553 members and $114,500 for acquisition and installation of generating facilities.

Other recent REA grants in the Western states include: $10,000 to Sulphur Springs Valley Electric Cooperative, Willcox, Ariz. for relending to members to purchase and install irrigation equipment: $50,000 to Intermountain Rural Electric Assn., Littleton, Colo., to complete a section of the system; $41,000 to Big Horn County Electric Cooperative, Lodge Grass, Mont.

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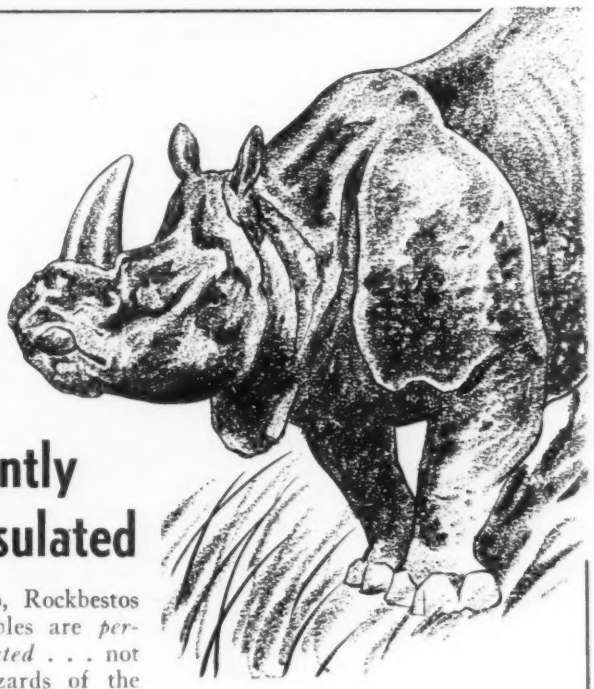

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Bound books are suitable for use of the majority of motor and control buyers. They contain prices (correct at time of issue and satisfactory for estimating purposes throughout the books' life), dimensions, application data and descriptions. Books include:

"Motor Buying Data" covering popular types and ratings of motors (up to 100 hp), Gearmotors and M-G sets.

"Control Buying Data" listing a wide variety of controllers and accessories for direct current, single-phase, squirrel-cage, wound rotor motors.

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Electrical Porcelain

PRIORITIES

Appliances Not Coming Soon, Other Orders Revised

WPB Vice-Chairman Charles E. Wilson, an ex-appliance man himself, told the domestic mechanical refrigerator industry advisory committee in January that "until the outcome of what lies ahead (the invasion of Europe) is clear—and there is no telling when it will be—production of refrigerators cannot be resumed. Our Army and Navy face what is probably the most perilous undertaking in military history. Industry must be kept flexible so that it will be able to meet the requirements for increased war production that may result from impending military operations. Materials are available but labor cannot be assigned to turn these into refrigerators. Labor is already short in many areas and with the next six months many men will be drafted out of industry."

● DOMESTIC electric flat irons will be made, however—2,076,000 in all, early this year. The 76,000 are earmarked for Army, Navy, etc., the remainder for civilians. Allocation of quotas to manufacturers has been made. Distribution will be through normal prewar channels.

● RADIO tubes have been promised also, at least 4,500,000 of the critical types, for civilian consumption, during the first quarter of 1944. They will be stamped MR and are not to be sold on rated orders. Types being pushed are 12-SA-7, 12-SQ-7, 12-SK-7, 50-L-6, 35-L-5, 35-L-6, 1-H-5, 1-A-7, and a few other critical types. Now if set owners may only buy them without bringing the set in for a phoney repair job in order to get them, there will be real relief.

● APPLIANCE repair shops were at last allowed to adjust their prices to include wage increases and overtime which have hampered them within recent months. Supplementary Service Regulations 21 and 22 to MPR-165, make the change. Details of the procedure are available in OPA Service Trades Bulletin No. 9, and available from OPA or OWI offices.

● WATT-HOUR meters, 169,000 of them, are authorized to be built by WPB's radio and radar division, for the first six months of 1944. Distribution will be made by OWU under L-151. Pressing need for them has been felt.

"No trouble to see why the boss specifies Chance Expanding Anchors

. . . they're a cinch to install and do a real holding job"

When it comes to the selection of expanding anchors, men who have tried and tested them, usually specify the Chance Steel Anchor, not because of its outward appearance, but because they know this anchor will do the job intended for it, and because the installation is simple and fool-proof.

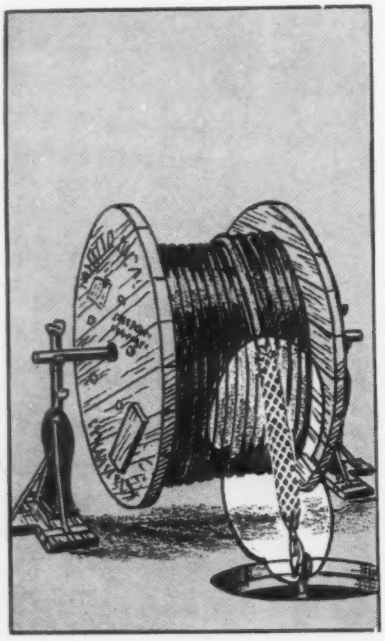
The all steel construction makes the anchor practically unbreakable. There is no chance for expanding arms to jump off because they are clamped on securely. The blades will not side twist during expansion, but must remain at right angles to each other, thus equalizing the strain at all points. The nut retainer, as shown below, prevents this anchor from riding up the rod during installation and permits salvaging the rod in case the anchor is to be abandoned. It is also possible to drive the rod through this retainer in case both anchor and rod are to be left in the ground.

Consult your Chance Catalog of Pole Line Equipment or ask your jobber.

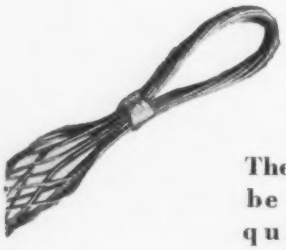
A·B·CHANCE CO. CENTRALIA MISSOURI

SPEED

CONSTRUCTION
and EXPANSION
of PLANT FACILITIES



RELIABLE CABLE GRIPS
For Pulling in
Wires and Cable



These grips can be installed quickly and pull cables dependably. They do not let go halfway through a duct because wires pull with evenly distributed load. Eight different styles—all supplied in a full range of sizes.

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ELECTRIC COMPANY
OVER 35 YEARS SERVICE TO THE UTILITIES
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PEOPLE
made this news

Utah Power Advances Fuller, Purton

L. B. Fuller, Utah Power & Light Co. chief engineer and for 38 years prominently identified with the intermountain area electrical industry, has been appointed engineering consultant for the company. T. A. Purton will assume the duties of chief engineer.

Fuller, a native of Ohio, came West and went to work for the Telluride Power Co., a predecessor of Utah Power & Light in 1906, some three months after his graduation from Cornell University. He has been associated with electrical development in the area since that time.

He superintended construction of practically every major hydroelectric and steam electric generating station which now make up the Utah Power & Light system in Utah and Idaho, and in 1927 was made assistant superintendent of power for the company. Two years later he became superintendent of power and in 1937 took over the duties of chief engineer.

Purton, a resident of Utah and Idaho from 1912 to 1937, has more recently served as an engineer for Ebasco Services, Inc., of New York. A native of Kansas, he was graduated from the University of Kansas in 1911. From 1912 to 1917 he was assistant engineer for the Union Pacific Railroad Co., stationed in Salt Lake City, and in Pocatello; Idaho. For three years he was employed by the General Electric Co. in Salt Lake City as an assistant engineer.

In 1920 Purton moved to Boise, where he served as office engineer for the Idaho Power Co. until 1937 when he went to New York.

Mullendore To Head Los Angeles Chamber

One of Los Angeles' highest honors was received by a member of the electrical industry when W. C. Mullendore, executive vice-president of the Southern California Edison Co., was installed Jan. 13 as president of the Los Angeles Chamber of Commerce for 1944.

Mullendore has had a long career of leadership in Los Angeles civic activities. He has been a member of the Los Angeles Chamber of Commerce since 1926 and has taken a leading part in its activities. He served as vice-president during the past three years.

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Minimize your voltage losses. Specify scattered transformers to eliminate duplicate conduit runs, and save on power costs.

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Puget Sound Officers Re-elected by Board

All officers of the Puget Sound Power & Light Co. were re-elected by the board of directors at its first meeting under the utility's recapitalization program on Jan. 12.

Frank McLaughlin will continue to serve as president, with S. P. MacFadden, executive vice-president and Charles F. Terrell, C. Patrick Johnson, H. C. Webb and Lawrence E. Karrer, vice-presidents.

Wendell W. Black was named secretary to fill a vacancy caused by resignation of Lowell P. Mickelwait, now a captain in the Army Air Corps.

Bear Retires Following 18 Years with PG and E

William P. "Teddy" Bear retired after 18 years' service with Pacific Gas and Electric Co. on Dec. 31 and immediately affiliated himself with the U. S. Maritime Commission in Oakland. Having reached retirement age, Bear nevertheless wished to continue in war work. He has been connected with the general sales department, handling lighting and special valuation studies since June 20, 1925.

Bear came to California in 1924 from Chicago where he had been connected with Day & Zimmerman in industrial valuation and with Sanderson & Porter in utility valuation engineering. His first connections in California were with the old Magnavox Co. at Oakland. He was loaned by PG and E to the Pacific Radio Trades Assn. to run two of its annual radio shows at the Civic Auditorium in San Francisco. Bear has also been chairman of the San Francisco Bay Cities Section, Illuminating Engineering Society, on two different occasions.

● Henry G. Shade, custodian of the Portland General Electric Co., died Jan. 10 at the age of 71. He had been connected with the electrical business since 1892, when he went with Willamette Falls Electric Co., a predecessor of PGE. When the company was expanding from a supplier of arc and incandescent lighting to take on power load, he sold electrical apparatus throughout the Northwest. He was at one time the company's purchasing agent and later was in charge of its securities department.

● John H. Fagg, 59, manager of Pacific Gas and Electric Co.'s DeSabla division and a 38-year veteran of the company, died recently following a heart attack.

Putting 'em Thru the Mill!

Strip for Action! Strip made from WILBUR B. DRIVER CO. special alloys! Strip that has so many essential war uses! As it is rolled through their mills, day and night, we know it will do its part in flattening the Axis!

Consult us for your special alloy requirements in rod, wire, ribbon and strip—both hot and cold rolled.

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Carbon Products

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Commutation,
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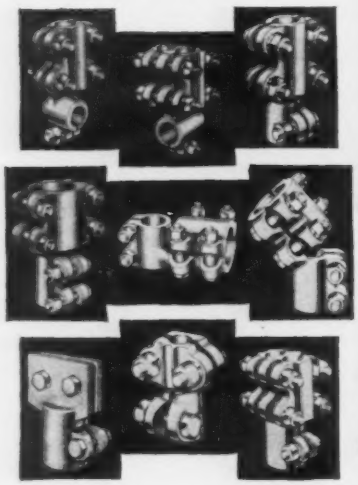

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PENN-UNION
Conductor Fittings

● FRANK MCGINLEY, pioneer electrical contractor of Wilmington, Los Angeles, died, age 63, after extended illness, early last month. He was president of the Building & Safety Commission of the city of Los Angeles and chief of the fire alarm control division.

TRADE *notes*

G-E Establishes New Los Angeles Branch

General Electric Co. has announced the establishment of a distributing branch in Los Angeles and appointment of Chris W. Griffin as manager. The new branch is located at 212 N. Vignes St.

Griffin joined G-E in 1930, following experience as manager of several large radio distributorships in southern California. Following nine years as the company's radio sales manager for the Western region, he became sales manager for the George A. Belsey Co., former G-E appliance distributor in Los Angeles. After Pearl Harbor, he joined the south Pacific sales district of the G-E lamp department.

The new distributor branch will serve dealers throughout the Los Angeles wholesale area, handling sales of G-E refrigerators, ranges, home laundry equipment, water heaters, dishwashers, disposals and kitchen cabinets, as they become available.

Allis-Chalmers Reports Personnel Changes

Allis-Chalmers Mfg. Co. has announced two personnel changes.

James H. Pestalozzi has been appointed regional engineer, with headquarters in San Francisco. For several years, Pestalozzi had been working on the company's marine developments, specializing in main drive and generating equipment. His new duties will be supervision of engineering procedure in nine Western states.

C. T. Hurd will be Northwestern Central station specialist, with temporary headquarters in Seattle. His territory will include the states of Oregon, Washington and Montana.

● Sylvania Electric Products has announced the appointment of George C. Conner as California division manager of its equipment tube sales. A native of Washington, Conner has had 17 years of experience in radio engineering, 10 of them as field engineer in Sylvania's equipment sales division. For the past year, he has been working with government radio laboratories on military electronic equipment.

● PACIFIC ELECTRIC MOTOR CO., Oakland, has announced changes in its management owing to the recent death of its president, Walter D. Vance. His partner, Frank E. Boyd becomes president. Mrs. Lina K. Vance, widow of Walter D. Vance, will be vice-president; W. D. Vance, Jr., secretary-treasurer; G. R. Duncan, executive engineer in charge of engineering and sales.

● LANDERS, FRARY & CLARK has announced the appointment of Thompson & Holmes Ltd., San Francisco, as exclusive distributor in northern California for Universal ranges, vacuum cleaners and home laundry equipment. The firm also will merchandise Universal small appliances.

● SUNSET ELECTRIC CO. of Seattle has leased a two-story brick and concrete building at First and Adams in Spokane. The building has a frontage of 50 ft. on one street and 156 on the other, both streets being faced by large plate glass windows.

● EMPLOYEES of the Phelps Dodge Copper Products Corp., Los Angeles tube division, received the Maritime "M" award in recent ceremonies at the plant.

Member A.I.E.E
JULIEN H. DAVIS
Consulting Engineer
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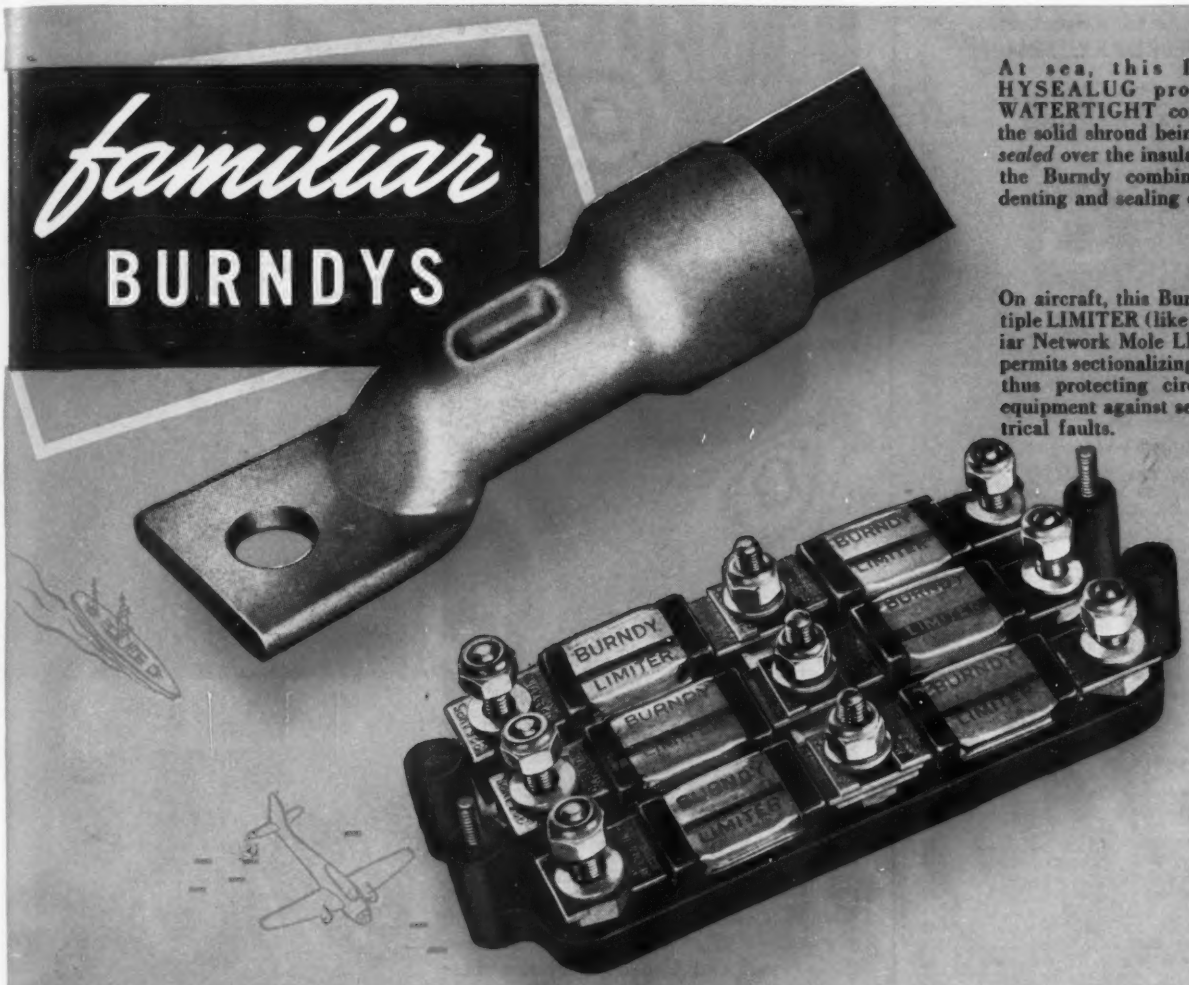

At sea, this Burndy HYSEALUG provides a WATERTIGHT connection; the solid shroud being readily *sealed* over the insulation with the Burndy combination indenting and sealing die.

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. . . dressed for War

To the utility industry, America owes much for the outstanding efficiency of its electrified fighting equipment. Basic utility designs for networks and electrical components are in evidence everywhere . . . a tribute to the engineering skill and foresight of the utility engineer.

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PROFILES *of the month*

From somewhere in Italy Wayne Snowden, now Major, Ordnance, 3rd Division, took this breather from the supply lines to combat troops for a picture home. He is Electrical West's engineering editor, on military leave. He landed with the U. S. Army at Casablanca, again when it took Sicily, and is on the road to Rome these days

Ted Crosby, Washington Water Power publicity manager, with his brother, Bing. The picture was snapped during a vacation trip to Bing's ranch near Elko, Nev. Ted Crosby shot the deer

Bill Wilt, of Bussmann, had charge of exhibits when the electrical inspectors met last. With him is Bill Tretheway, Huntington Park chief inspector

Right, T. A. Purton, appointed chief engineer for Utah Power & Light to succeed L. B Fuller, above. Fuller has been named engineering consultant for the utiilty. A member of the company and its predecessors for 38 years, he has superintended the construction of major hydroelectric and steam electric generating stations now making up the Utah Power & Light system

WE BOUGHT EXTRA WAR BONDS

4TH WAR LOAN

This shield shows you are fighting this war too!

Show Your Colors

MILLIONS of these red, white and blue shields will proudly gleam from windows throughout America in the next few weeks. They will show the Nazis and Japs that Americans can successfully finance as well as fight a winning war.

Yes, the 4th War Loan is on. The amount needed is $14,000,000,000. This amount must be raised between January 18 and February 15. That is the objective. Nothing has stopped our boys in the air, on land or at sea. Nothing must stop the "over top" purchase of war bonds during the present drive.

Show your colors. Display the shield of the 4th War Loan in your home. It shows you bought extra War Bonds to back the attack.

P·G·and E·
PACIFIC GAS AND ELECTRIC COMPANY

***Let's All* BACK THE ATTACK!**

BUY EXTRA WAR BONDS NOW

BUILD FOR YOUR FUTURE WITH THE WORLD'S SAFEST INVESTMENT

United States War Savings Bonds, Series E: gives you back $4 for every $3 when the bonds mature. Interest: 2.9% a year, compounded semi-annually, if held to maturity. Denominations: $25, $50, $100, $500, $1000. Redemption: any time 60 days after issue date. Price 75% mature value.

2½% Treasury Bonds of 1965-1970: readily marketable, acceptable as bank collateral, redeemable at par and accrued interest for the purpose of satisfying Federal estate taxes. Dated February 1, 1944. Denominations: $500, $1000, $5000, $10,000, $100,000, $1,000,000. Price: par and accrued interest.

Other Securities: Series "C" Savings Notes; ⅞% Certificates of Indebtedness; 2¼% Treasury Bonds of 1956-1959; United States Savings Bonds Series "F;" United States Savings Bonds Series "G."

EW 102-244

DISPLAY THIS *Emblem* IN ALL YOUR ADVERTISING

Reams have been written about wiring "bottlenecks" and why we need good wiring to make the dream of postwar electrical living a reality, yet a great part of the time we have been talking to ourselves within the industry.

Let's recognize this and use the Adequate Wiring Key as a reminder piece in all consumer advertising. It will add but a few pennies to cost of production and nothing whatever to cost of space, yet the repetition by many firms in many types of media should certainly have an effect.

The design is available in 2, 3 and 4-inch cuts at 85c each, or in mats at 20c each. Order direct from the National Adequate Wiring Bureau, 155 East 44th Street, New York City.

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